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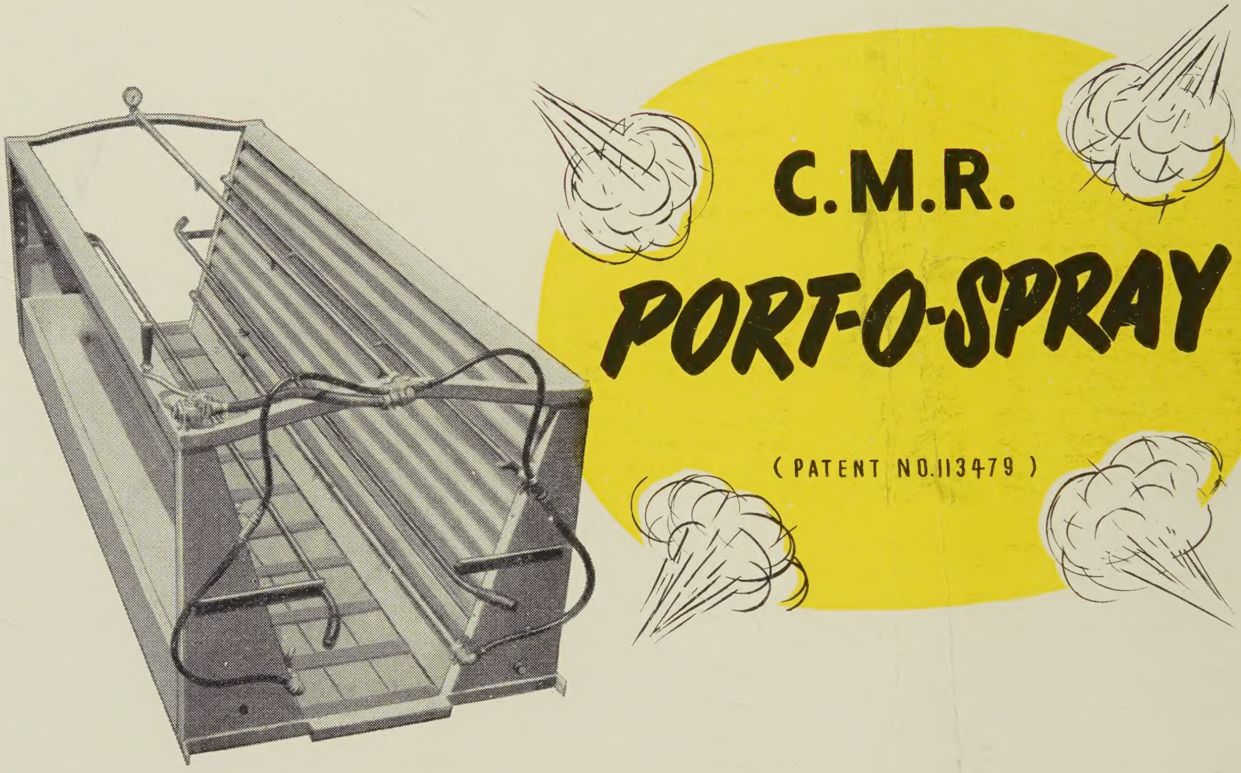

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Shadows of late afternoon in autumn dapple this scene in the Central Otago, South Island, lakeland. Sheep pastures in the foreground border Lake Hayes. Towering in the background above the waters of Lake Wakatipu are the snowy tops of Cecil Peak (left centre) and Walter Peak (right centre background). Irrigation farming is practised in this area of low annual rainfall and very dry summers. Photograph by R. V. Francis Smith.

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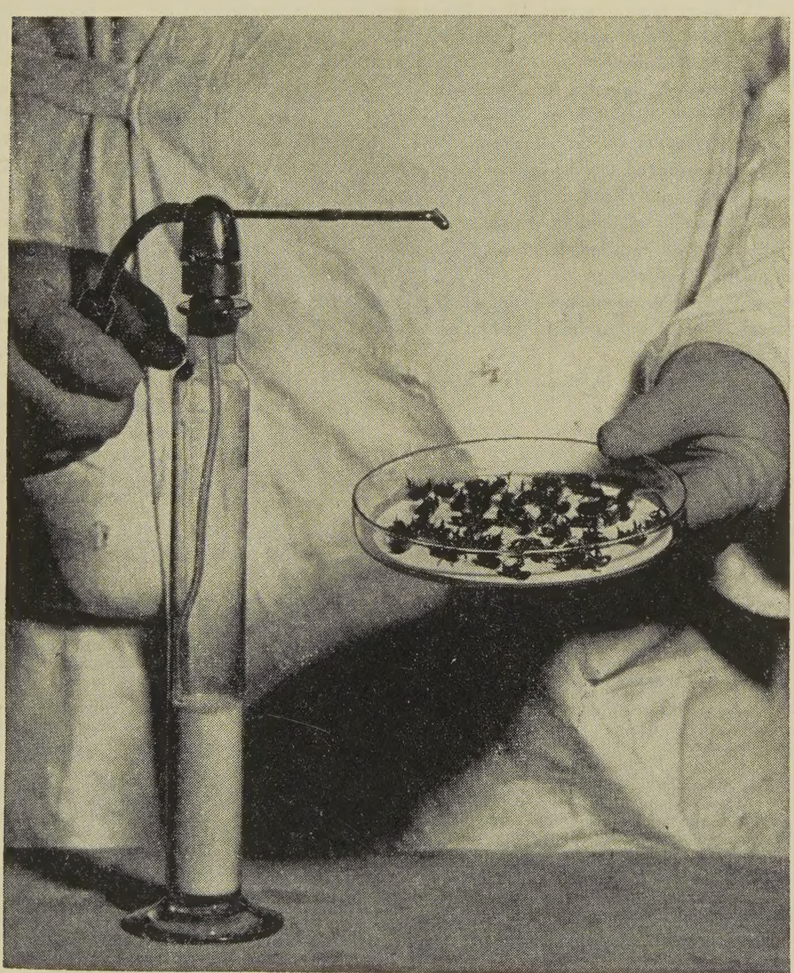
Agricultural Chemicals and the Beekeeping Industry

By T. PALMER-JONES, Principal Scientific Officer, Department of Agriculture Animal Research Station, Wallaceville, and I. W. FORSTER, Apiary Instructor, Department of Agriculture, Oamaru

NEW ZEALAND agriculture is becoming increasingly dependent on the use of agricultural chemicals. If improperly used, these may cause losses of the honey bees necessary for pollination. It is not always advisable to rely on the results of overseas trials of these compounds and so it is often necessary to test their effect on bees when applied under local conditions before recommendations for their safe use can be made. The authors outline methods of conducting such tests, summarise the results obtained, and give recommendations for the use of agricultural chemicals in New Zealand in such a way as to minimise the chances of honey bee mortality.



← Spraying anaesthetised bees with an agricultural chemical.

IT is now realised in all progressive agricultural countries that the honey bee is essential for effective pollination of many species of plants. In New Zealand agriculture honey bees are fully as necessary as elsewhere. One of our most valuable pasture plants is white clover, which is carried on partly by its seeds, which are almost entirely dependent on honey bees for the pollination necessary for their germination.

Apart from the seed which must set to help in natural regeneration, much white clover seed is harvested in New Zealand for sowing new pastures. White clover seed also forms a valuable export, over £500,000 worth having been exported recently in one year alone. Our brassicas, fruit trees, and many other seed crops rely almost wholly on honey bees for pollination.

The only satisfactory way in which adequate bee coverage can be provided for pollination is through the maintenance of a thriving beekeeping industry. Beekeeping is a highly skilled and onerous occupation and unless it provides an adequate income will not attract sufficient beekeepers to supply the needs of New Zealand agriculture.

Countries with highly developed systems of agriculture are increasingly dependent on aerial and ground application of agricultural chemicals which are used to control insect pests, fungous diseases, weeds, and noxious animals. These compounds are often toxic to honey bees and other beneficial insects. So it was not long before their indiscriminate use caused heavy losses of bees in many countries, which then found it necessary to protect the interests of their beekeepers by legislation.

Every effort was made in New Zealand to warn those associated with the application of insecticides, fungicides, herbicides, and rodenticides of the danger many of these constituted to bees, and to secure their cooperation in preventing bee mortality, but it soon became evident that the beekeeping industry was not safeguarded by a system which depended solely on voluntary control by many conflicting interests. However, it was only when these measures definitely failed that protective legislation was introduced.

Serious losses of bees in orchards in 1947 first showed the shortcomings of voluntary control and resulted in the passing of legislation which prohibited the treating of fruit trees and small fruits during the flowering period with compounds toxic to bees. In 1955 heavy bee mortality occurred through aerial dusting with lindane of chou moellier in flower, and it was evident that no policy which depended solely on warning and education was adequate for the protection of our honey bees.

Finally the Apiaries Protection Regulations were passed in 1957. These prohibit the application of agricultural chemicals toxic to bees to cruciferous and leguminous field crops or to flowering plants within these crops during the period (September to March) when they are attractive to bees.

We cannot put the clock back and the use of agricultural chemicals is essential for New Zealand farming and will continue to increase. If these compounds are applied in such a way as to avoid bee mortality, they will benefit the beekeeper indirectly by aiding the farmer to raise a larger acreage of crops which will provide more nectar and pollen.

Now that the beekeeping industry is protected by legislation technical advisory officers are under an even stronger obligation than before to assist crop growers by conducting trials of agricultural chemicals with the aim of discovering ones which can be used effectively to control pests without harming bees.

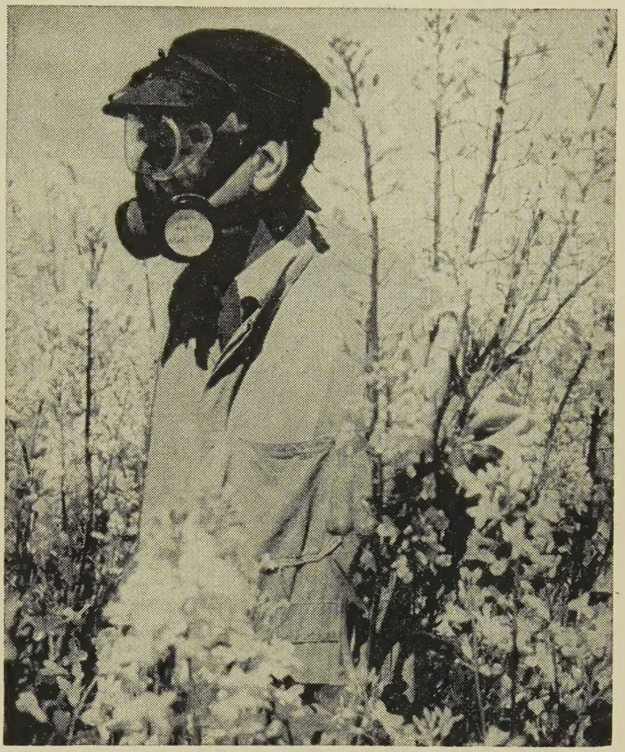
The methods used in the laboratory and in the field for testing the toxicity to bees of agricultural chemicals are briefly described below.

Introduction

When agricultural chemicals are applied in the field their toxic effect on honey bees depends on weather conditions before, during, and after application, on the repellency of the chemicals and their formulations, on the method of application, on systemic effect, and on a number of other factors which cannot be duplicated in the laboratory. The methods used by bees in collecting nectar and pollen from different kinds of flowers vary and so the type of plant to which the agricultural chemical is applied may also have some bearing on its effect.

Field trials based on methods outlined later will therefore always be necessary before we can finally decide whether or not a new agricultural chemical is safe to bees. But because field trials are time consuming and costly, it is usually not practicable to apply them at short notice to all agricultural chemicals as these come on the market.

It is not always advisable to rely in New Zealand on the results of overseas trials, because our climatic conditions, the type of crop to which the agricultural chemical is applied, the method of application, and the concentration are usually different. Hence, the preliminary screening of new agricultural chemicals in the laboratory can be of value, as it enables us to select quickly and cheaply the most promising ones for field trials.



Counting bees in a chou moellier crop sprayed with metasystox. Note protective clothing and face mask.

Laboratory Methods

Agricultural chemicals may act on honey bees as stomach poisons, contact poisons (dry or wet), and fumigants. Also, though this should be avoidable, bees may be sprayed or dusted with agricultural chemicals during field applications. The following tests are used at Wallaceville to study these effects.

Stomach Poisons

If consumed in sufficient quantity, most agricultural chemicals will kill bees. When the effect of these compounds on bees as stomach poisons is being tested in the laboratory it is necessary to establish a standard of toxicity so that comparisons can be made. The accepted standard is taken as being the concentration of the compound required to kill half the bees dosed. This lethal dose is called the LD50 per cent. If the standard dose were taken as being one which just killed all the bees, it would be very difficult to avoid exceeding the minimum required; and if it were taken as being one just below the amount required to cause mortality, it would also be very difficult to assess. Hence a dose which kills half the bees is taken as a standard; because it is easy to decide when it has been reached.

To determine the lethal dose feeders are charged with accurately measured drops of a sugar solution containing a known strength of an agricultural chemical. Bees are starved and then fed these drops individually, after which they are kept under observation. A series of concentrations of the agricultural chemical is dosed to the bees until the LD50 per cent is obtained.

Contact Poisons

A thin film of the agricultural chemical is sprayed evenly over one side of a sheet of tin-foil of a standard area. The foil is weighed before spraying and after the spray has dried and then used to line completely the inside of a cage. Fifty bees at a time are exposed for an hour in the cage to a series of doses of the agricultural chemical under test.

Fumigants

Fumigant effect is studied by using circular cages in the upper half of which 50 bees are confined so that they are exposed to vapour ascending from the bottom of the cage. Here a filter paper is soaked with a standard volume of the particular dilution of the agricultural chemical under test.

Sprays

Batches of 50 bees are anaesthetised with carbon dioxide and sprayed with a standard volume of the particular dilution of the agricultural chemical under test.

After all tests the bees are confined in cages supplied with sugar syrup and mortality noted after 24 hours. The cages are kept in 30 degrees C. incubators.

Table 1 summarises results obtained by applying these tests to a range of the newer agricultural chemicals.

The figures in Table 1 under the heading "Dangerous minimum as contact poison" are obtained by finding the smallest weights of agricultural chemicals which cause serious mortality of bees exposed to their contact effect on a known area of

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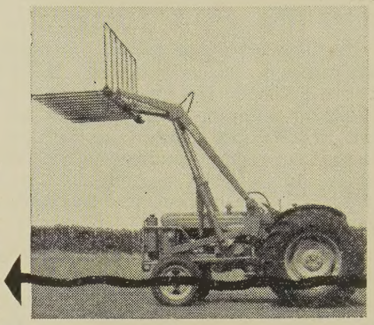

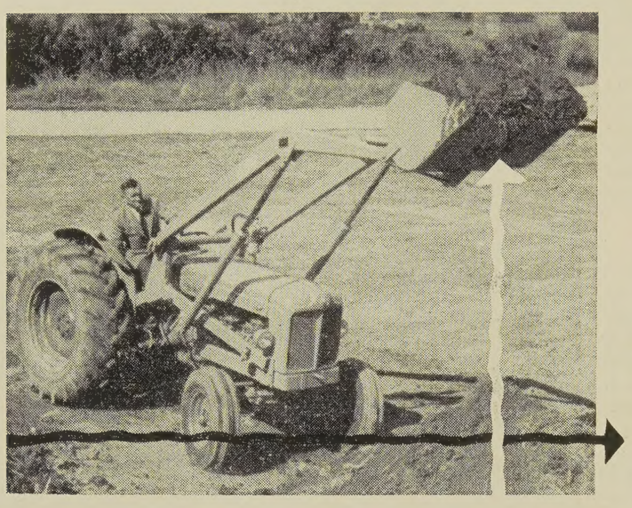

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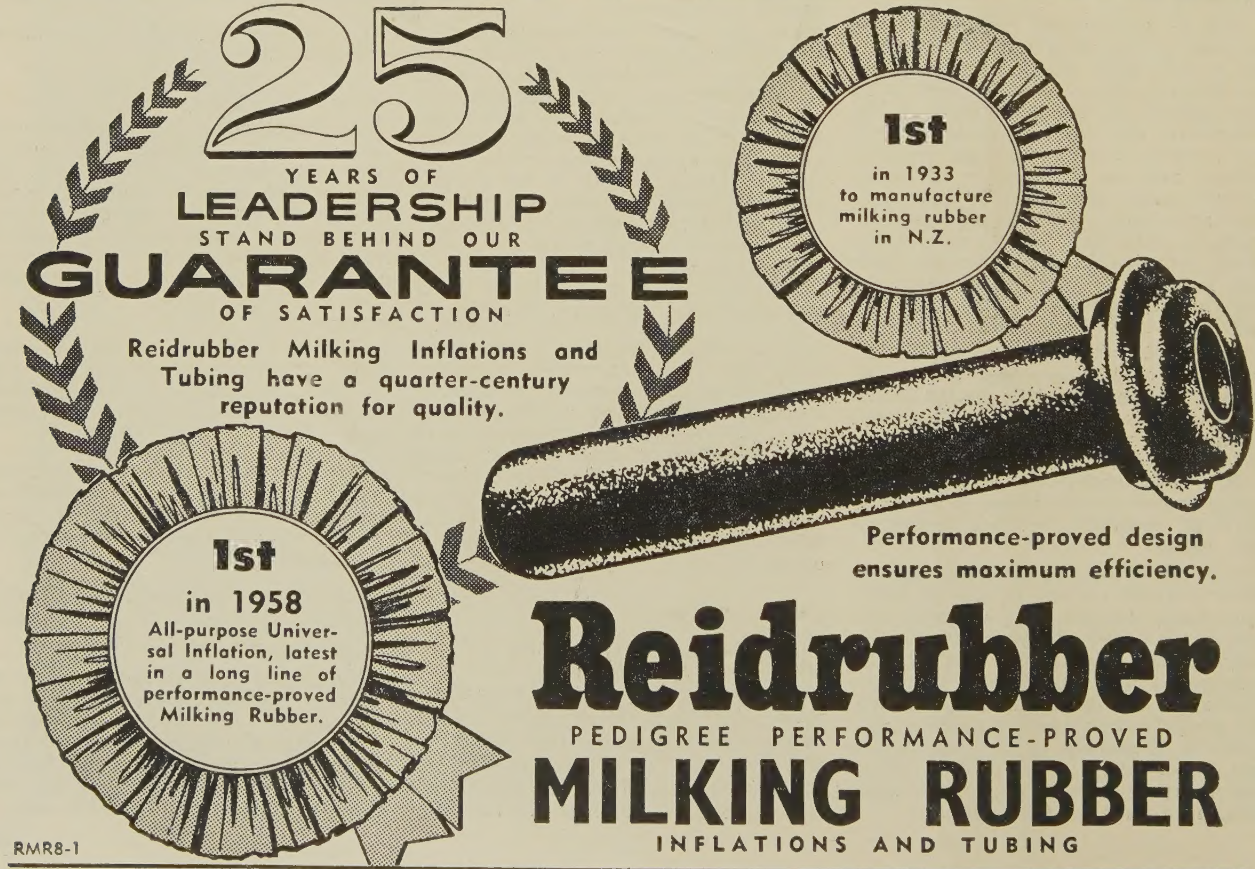
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TABLE 1—RESULTS OF LABORATORY TESTS

	LD50 per cent as stomach poison (millionths of a gramme)	Dangerous minimum as contact poison (oz. acre)	Dangerous minimum per cent strengths of solutions	
			As fumigants	As sprays
Toxaphene	20	49 (80)	5+	0.5
Strobane	25	30 (80)	5	1
Thiodan	4.4	4 (32)	5+	0.5
Primin	0.38	2 (1)	0.5	<0.1
Diazinon	0.24	2 (1)	0.1	<0.1

tin-foil. These weights are then expressed as so many ounces per acre to permit comparison to be made with the maximum field application likely to be made in practice (given in brackets).

The figures under the heading "Dangerous minimum per cent strengths of solutions" give the strengths of agricultural chemicals which will kill bees when applied in laboratory tests as fumigants and sprays.

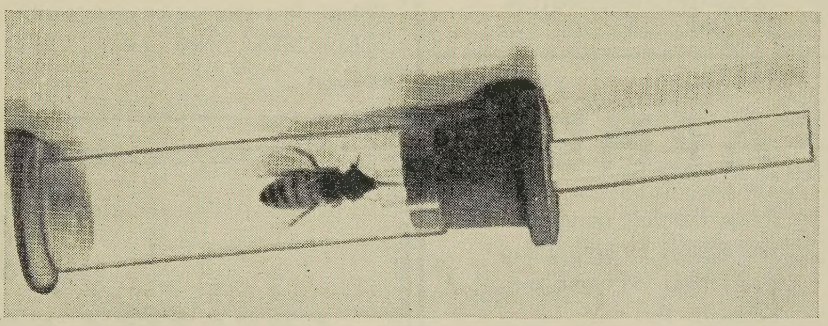
If agricultural chemicals are likely to cause bee mortality, they will generally be applied to flowering crops in the evening or early morning when bees are not flying, so as to avoid losses through direct contact and reduce fumigant action. This contact effect does not usually persist for long under field conditions. But agricultural chemicals may also affect bees as stomach poisons through becoming dissolved in nectar or water or contaminating pollen; hence, when evaluating the results summarised in the tables, more attention should be paid to the effect of the agricultural chemicals as stomach and contact poisons than to their effect as fumigants and sprays.

Experience has shown that the contact effect of agricultural chemicals on bees is sometimes exaggerated in laboratory tests, but the results obtained are accurate in a relative sense.

It can be seen from the tables that though strobane is slightly less toxic to bees as a stomach poison than toxaphene, its effect as a contact poison is greater. It would be predicted from the table that field applications of strobane would be slightly more toxic to bees than field applications of toxaphene.

The effect of toxaphene on bees has been fully investigated in the United States of America, where it has proved safe to use on crops attractive to bees if applied in the early morning or evening when they are not flying. It therefore furnishes a useful standard to work from when the results of laboratory tests of agricultural chemicals are used as a basis for predicting their effect on bees in field applications. We would expect from the results of the laboratory tests that strobane if applied similarly to toxaphene would prove safe to use on crops attractive to bees.

The ascending order of toxicity to bees of field applications of these agricultural chemicals is considered to be toxaphene, strobane, thiodan, primin, and diazinon. Applications of thiodan, primin, and diazinon would be expected to cause heavy bee mortality.



▲ Bee consuming measured volume of agricultural chemical.

Field Methods

When testing the effect of an agricultural chemical on bees we expose the maximum number of field bees to the maximum quantity of chemical likely to be applied per acre of crop. Consequently the aim in field experiments is to apply the agricultural chemical when flowers on the treated area are being visited by many honey bees. It follows that the flowers of the crop must bear nectar attractive to bees; weather conditions on the day of the experimental application must favour bee activity because bees are most susceptible to the action of an agricultural chemical on the day it is applied.

Sometimes pollen may be poisoned by an agricultural chemical and cause mortality of brood in hives. So bees from the experimental apiary should collect pollen from the treated field. In practice it is very difficult to satisfy all these requirements and usually a compromise must be accepted.

TABLE 2—RELATIVE TOXICITY OF AGRICULTURAL CHEMICALS

	As stomach poisons	As contact poisons	As fumigants	As sprays
Toxaphene	1.25	1	1	2
Strobane	1	1.6	1	1
Thiodan	5.7	12.25	1	2
Primin	66	24.5	10	10
Diazinon	104	24.5	50	10

It has been our experience that field experiments are hindered more by wind than by any other cause. We have sprayed an agricultural chemical from the air over 12 acres of a crop at 4.30 a.m. under ideal weather conditions only to return after breakfast and find that such a strong wind had arisen that no bees would leave their hives during the day. All we could do was to repeat the application a few days later. Sometimes we have found it necessary, because of adverse weather, to delay treating a crop with an agricultural chemical so long that its flowers began to lose their attractiveness to bees.

Field bees are particularly vulnerable to direct spraying and dusting with agricultural chemicals. However, especially in aerial applications, agricultural chemicals are usually put down in the early morning or evening, because conditions then are calm and drift is avoided. Bees do not fly at such times and so with little inconvenience to agriculture it is possible to avoid exposing bees to the dangers associated with direct spraying and dusting. Therefore we do not as a rule find it necessary to study the effect on bees of agricultural chemicals applied to pastures or crops while these are actually being visited by field bees.

The following methods have been developed for assessing the effect on bees of agricultural chemicals applied to crops and pasture.

Experimental Hives

If the experimental area is not adequately served with bees, an apiary is hired, the beekeeper being compensated for any loss of bees which occurs. The condition of the experi-

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mental hives is checked at intervals before and after the agricultural chemical is applied. A layer of grass is removed in front of the hives to expose a bare surface on which dead bees can be easily seen. If commercial apiaries are within bee range of the experimental area, it is necessary to discover what proportion of field bees on the experimental crop come from the experimental apiary. This is done by marking bees as they leave the hive with aluminium paint powder applied by a device which fits over the front of the hive.

Counts of Field Bees

It is essential to count bees on the crop to obtain a picture of bee activity before and after an agricultural chemical has been applied and also to measure any repellency it may exert. We do this by running a tape 100 yds. out from the edge of the experimental field; then two of us walk at random slowly across the 100 yds. axis of the marked area counting all the bees in our forward range of vision. We then walk back, and as we count bees in a strip about 1 yd. wide, the total bee count is really for 400 sq.yds., which can be expressed as so many bees per acre.

Caging and Observation of Field Bees

After the agricultural chemical has been applied to a crop, field bees are picked off the flowers and kept under observation at 30 degrees C. in cages supplied with feeders of sugar syrup. Control bees show negligible losses when held under such conditions, and so undue mortality is readily detected.

Counts of Flowers

Counts of flowers in experimental fields have been found very useful, as they enable us to compare the potential attractiveness to bees of experimental pastures in different areas.

The procedure followed is to walk at random across the experimental field, place the centre of one side of a 1 ft.-square wire gauge against the toe of the forward shoe at the completion of each 10 paces, and then count all the flower heads enclosed by the gauge. Fifty counts are made, the flower heads being classed as seeded or flowering.

Bumble Bees

Bumble bees are counted and identified as long- and short-tongued species; the effect of agricultural chemicals on them is studied.

General

Weather observations are made. Pollen traps are placed on hives in the experimental apiary so that it can be determined whether or not bees are collecting pollen from the treated field.

During the last 8 years the toxicity to bees of a variety of agricultural chemicals has been tested by the Department of Agriculture. It will be seen from the summary of these tests that the aim has been to concentrate on those agricultural chemicals of value to New Zealand agriculture, but of whose action on honey bees under local conditions little was known.

TABLE 3—SUMMARY OF RESULTS OF NEW ZEALAND TESTS

Agricultural chemical	Use	How applied	Recommendations
DDT	Control of grass-grub and subterranean grass caterpillar in white clover pasture	Dust	Can be applied to pasture attractive to bees without causing mortality if application made in early morning before bees commence flying or in the evening after activity has ceased
DDT	Control of lucerne pests	Spray	Can be applied to lucerne attractive to bees without causing mortality if application made in early morning before bees commence flying or in the evening after activity has ceased
Metasystox ..	A systemic insecticide for control of sucking insects (aphids)	Spray	Must on no account be applied to plants with flowers attractive to bees; plants must be sprayed at least 14 days before flowering
Toxaphene Strobane	Possible control of clover case bearer moth in white clover seed crops. Control of other insects	Dust and spray Spray	Toxaphene can be applied to pasture and plants attractive to bees in safety if application made in early morning before bees commence flying or in the evening after activity has ceased. Strobane applied at similar times is safe on clover pastures but should be used with caution on crops.
DNBP plus DNAP PCP Endothal	Defoliants	Sprays	Can be applied during day to crops attractive to bees
2,4-D MCP ..	Hormone weedkillers	Sprays	Can be applied during day to crops attractive to bees
DNOC	Chemical weedkiller	Spray	Must on no account be applied to plants with flowers attractive to bees
Thiodan Primin Diazinon		Tested in laboratory only	Must on no account be applied to plants with flowers attractive to bees; plants must be sprayed at least 14 days before flowering

Tests on Agricultural Chemicals

Chemical Weedkillers

Hormone- and non-hormone-type weedkillers are now used extensively in New Zealand. Laboratory tests of 2,4-D and MCP acid preparations carried out at Wallaceville when little was known of their effect on bees showed these compounds to have a very low toxicity and it is considered that their use constitutes no hazard to the beekeeping industry. However, it was found that the herbicide sodium salt of dinitro-ortho-cresol (DNOC) was highly toxic to bees and should not be used on crops attractive to them.

DDT Dust Applied to Pastures

DDT is applied extensively in New Zealand as a dust to control the grass-grub (*Costelytra zealandica* (White)) and the subterranean grass caterpillar (*Oxycanus* spp.) which formerly caused great damage to pastures. A field experiment showed that the DDT could be applied as recommended for the control of these insects without causing harm to honey bees.

Metasystox Applied as a Spray to Chou Moellier

Cruciferous crops grown for seed in New Zealand are prone to aphid infestation, which reduces yield. Metasystox, a new systemic insecticide, had been shown to be an effective aphidicide and was claimed by the overseas firm which developed it to be safe for bees provided it was applied after they had ceased flying for the day. Metasystox thus appeared to be ideal for aphid control in New Zealand. But it was considered that the claim of its safety for bees was based on inadequate evidence and accordingly an experimental application was made to a crop of chou moellier (*Brassica oleracea*). Metasystox proved highly toxic to bees and so this systemic insecticide should on no account be applied to flowering crops which are visited by honey bees.

Toxaphene and Strobane Applied to White Clover Pasture

White clover seed crops are subject to attack throughout New Zealand by the clover case bearer moth (*Coleophora spissicornis* and *C. alcyonipennella*), which causes heavy losses of seed. It is considered that one of the most likely times at which the moth would respond to control by agricultural chemicals is in the spring and summer, which is a period when the infested clover pasture is also attractive to honey bees. So experiments were carried out with the object of discovering what agricultural chemicals could be applied to the pasture without harming honey bees. The Department of Scientific and Industrial Research would then test the effect of these compounds on the clover case bearer.

The screening of agricultural chemicals by laboratory tests had shown that toxaphene and strobane were the least likely to cause bee mortality in field applications, so in a series of experiments toxaphene was applied to clover pasture as a spray and as a dust and strobane as a spray. It is considered that toxaphene causes no bee mortality and strobane negligible mortality if applied to the flowering clover pasture when bees are not flying. The Department of Scientific and Industrial Research is now testing the effect of these compounds on the clover case bearer moth.

DDT Applied as a Spray to Lucerne

Lucerne (*Medicago sativa*) is grown extensively in New Zealand and large areas are set aside, particularly in the South Island, for seed production. The more progressive seed growers hire hives of bees to reinforce the existing pollinating insects. During the period when bee activity on lucerne is most necessary for pollination the crop can be severely damaged by infestation with various insects. Prompt steps must be taken to protect a crop against these insects by the application of an agricultural chemical, but if it causes bee mortality the grower will lose the services of the bees as pollinators.

DDT applied as a spray was considered to be one of the most suitable agricultural chemicals to control the variety of insects which infest lucerne. An experiment was carried out to find if DDT could be sprayed on lucerne in flower without harming bees.

Results showed that if applied early in the morning before bee activity commenced the DDT spray caused no bee mortality.

Defoliants Applied to Clover Pasture

Particularly in seasons which favour luxuriant growth, it is often necessary to defoliate white clover at a time when the crop has still many flowers which are attractive to honey bees. The two principal defoliants used at present on white clover are a mixture of dinitro-ortho-secondary-butyl-phenol plus dinitro-ortho-secondary-amyl-phenol (DNBP plus DNAP) and penta-chloro-phenol (PCP). It was considered that the use of these defoliants on clover pasture attractive to bees might cause heavy mortality. Another defoliant tested was endothal.

TABLE 4—TOXICITY OF AGRICULTURAL CHEMICALS TO HONEY BEES

Not harmful to bees	Should not be applied directly on bees visiting flowers, but in early morning and evening when they are not flying	Highly toxic to bees. Must not be applied at any time to crops in flower
DNBP plus DNAP* Endothal* MCP* PCP* 2,4-D*	DDT dust and spray* Strobane* Toxaphene dust and spray*	Diazinon* DNOC* Metasystox* Primin* Thiodan* Aldrin BHC
Aramite Bordeaux mixture Captan Chlorfensone CMU Cuprous oxide Ferbam Maneb Nabam Nicotine sulphate PCPCBS Sulphur TCA Thiram (TMTD) Zineb Ziram	DDD Dipterex HETP (late evening) Methoxychlor Pyrethrum Rotenone Ryania Schradan Tedion V.18 TEPP (late evening)	Calcium arsenate Chlordane Chlorthion Dieldrin Endrin Lead arsenate Lindane Malathion Parathion Sabadilla

* Agricultural chemical tested in New Zealand.

Field experiments showed that the defoliants could be applied during the day to clover pasture attractive to bees without causing bee mortality.

The list (Table 4) which sets out the degree of toxicity of the main agricultural chemicals to honey bees is based on the results of local experiments and overseas experience.

It is apparent that the mode of action of agricultural chemicals on bees is complex and dependent on time of application, weather, and other factors which are often difficult to assess. Therefore, though the table will guide those who advise on the use of agricultural chemicals, it should not always be taken too literally; allowance should be made for choosing the right compound for a particular set of circumstances and in timing its application.

Experiments designed to find what effect agricultural chemicals have on bees will be continued so that we can base our recommendations more and more on tests carried out under local conditions.

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BRANDING—
Curse of the Wool Industry

By J. E. DUNCAN,
Wool Supervisor, Department of Agriculture, Wellington

SOME mills have given up buying lambs' wool altogether because of trouble they have had with unscourable brands ruining pastel-coloured fabrics. At Invercargill this season buyers refused to bid on certain lines of heavily branded second-shear wool. Some of these were test scoured by the Department of Agriculture and the brands were found to be of approved fluids which washed out completely. Nevertheless the buyers were not prepared to take a chance, and the appearance of the wool was certainly against it. Wool branding is no longer compulsory, but if growers insist on marking their wool in various ways, in their their own interests they should not overdo it, and whenever practicable the brands should be removed before sale.

Sheep in a branding trial carried out by the Department of Agriculture to determine whether branding materials are scourable.

IF a problem has persisted for two centuries, it must be a tough one, and this would still be an understatement if applied to wool branding. The difficulty lies in a conflict of interests and requirements. The farmer has always wanted to mark his sheep in various ways, and the manufacturer has always sought wool free from contamination. The wool grower needs a mark that will resist the weather and stay on his sheep for 12 months if possible, and the wool-scourer likes it to wash out completely in 12 minutes. The farmer and the maker of branding fluids both require a cheap product, but the ingredients of modern scourable branding fluids tend to be dear. So the problem has not been solved yet, but real progress has been made.

Preventive Legislation

South Africa passed legislation in 1930 requiring that brands should be clipped off and packed separately, but the real trouble remained—hidden in the rest of the fleece—in the form of small drops from the branding iron. These could not be removed and they found their way into the finished fabric.

New Zealand struck at the root of the trouble with an amendment to the stock Act in 1945. This provided that only Government tested and approved, **scourable**, wool-marking preparations could be sold or used, and also prohibited the dilution of approved branding fluids with harmful ingredients such as engine oil.

The Commonwealth Scientific and Industrial Research Organisation in Australia next brought out a scourable lanolin base emulsion formula—then called L.B.E.—and later an improved version, now on the market under the name "Si-ro-mark".

A further amendment to the New Zealand Stock Act in 1956 made wool branding optional instead of compulsory and limited the size of brands. The ideal of course would be to do away with **all** forms of wool marking and colouring, especially as synthetic fibres suffer from no such man-made handicap, but this cannot be expected just yet.

BRANDING WOOL . . .

Buyers' Suspicions

However it might well be asked what the manufacturer, and his agent the woolbuyer, now have to complain about. The answer is, "Very little, compared with even 10 years ago", but as a long-established habit dies hard, they still regard brands of any kind with undisguised suspicion. If the branding is excessive, they sometimes refuse to bid on a line of wool. This happened during the round of sales early in 1958, particularly with second-shear wool, in which the brands were often extra conspicuous, having been on the wool for only a few months and not being weathered to the normal extent.

Brands in lambs' wool often severely limit competition and price, because this type of wool is often used for delicate pastel-shaded fabrics, which could be ruined by the merest trace of brand. In a few cases the mills still have bother with unscourable brands, but only a fraction of their former troubles.

Change in Scouring Preparations

Some mills are complaining about even approved "scourable" brands because they have altered their own scouring methods and are unable to eliminate all the brands. Until quite recently the vast majority of wool-scouring works and mills used soap and soda ash to wash wool. All the approved scourable wool-marking preparations were designed to wash out in a hot alkaline solution of this type. Some of the detergents now being used as a "neutral" scour for wool make a poor job of removing brands, which may be immediately and unnecessarily condemned on this account.

The Commonwealth Scientific and Industrial Research Organisation in Australia, in making recommendations for processing wool containing its L.B.E. branding fluid, as far back as 1952 advised:

> At least one scouring bowl and preferably more should be above pH 10 and scouring temperatures should not fall below 120 degrees F., as the temperature and alkalinity of the scouring solutions are primary factors in the removal of the brands. Normal scouring with soap and soda ash removes practically all marking. Three-bowl scouring sets have proved satisfactory, but better results are obtained with the four-bowl type.
>
> Slight traces of the brand which remain after scouring become opened in carding and can be removed subsequently in back-washing or piece scouring. Alkaline conditions should be used in either of these processes in order to obtain complete elimination.
>
> When using non-ionic or sulphated anionic detergents, the pH value of the solutions should be raised to at least 10 by the addition of an alkali such as soda ash.

Do's and Don'ts

A summary of recommended methods is as follows:

In the interests of the wool industry as a whole don't brand at all if you can avoid it, but don't expect an automatic premium on your wool price on this account.

If you must brand, don't overdo it. Excess fluid and large brands can be avoided. Brands on the rump are easier to skirt off with less damage to the fleece than those on the flank or shoulder. Don't brand lambs unless you have the strongest reasons for doing so.

Make sure you use an approved fluid bearing a label to this effect. Mix it thoroughly before use and don't allow anyone to dilute it, except according to the maker's instructions.

The ideal is to remove all brands while skirting, but if this cannot be done, at least the more conspicuous ones should be taken out and kept separate. Don't use bloom dips, as you will be fooling nobody except possibly yourself if the woolbuyers should get suspicious and penalise your wool. If you tupmark rams, make sure that scourable materials only are used; otherwise a great quantity of good wool will be spoilt.

Finally, remember that any kind of wool colouring is against the best interests of the industry. That it is necessary is doubtful; that it is undesirable is a certainty.

Turnip and Swede Varieties

BEFORE the last war New Zealand farmers depended on overseas sources for turnip and swede seeds. Since 1940, however, a plan has been operating to ensure that an adequate supply of seed has been grown in New Zealand.

A FULL supply of a range of swede and turnip varieties to meet the differing soils and climates and the various feeding requirements of individual farmers is available, and in some instances varieties have been produced to meet the needs of certain districts.

Swedes

The swedes Superlative, Crimson King, and Grandmaster fulfil general requirements. In addition, there are Calder and Yellow Fleshed Sensation, which grow deeper in the soil and are more useful for the drier districts. They are also resistant to aphis (blight) and virus disease. Wye swede is a white-fleshed, purple-top type and is recommended solely on account of its high resistance to club root disease. It also has some resistance to aphis and virus disease. Wilhelmsburger, a late-maturing swede, has high feed value and keeping qualities and is resistant to aphis and virus. It is a good swede for cold regions, and should be reserved for late winter-early spring feeding.

Among turnips both yellow- and white-fleshed varieties are featured.

Yellow-fleshed Turnips

Purple Top Yellow and Green Top Yellow are relatively hard, yellow-fleshed, long-keeping types recommended for cold districts where the fertility is reasonably good. They are very suitable for growing during the breaking-in process of land in such localities. Purple Resistant and Green Resistant are similar types to the above, but they also possess a high resistance to club root disease. A good sort of semi-hard yellow-fleshed turnip for wintering young sheep is Waites Eclipse. It thrives well, is semi-tankard in shape, and stands nicely out of the ground. Champion Hybrid is an early-maturing, tankard-shaped, softer type of yellow-fleshed turnip. It is more suitable for poor soils. If not sown too early, it keeps surprisingly well into winter.

White-fleshed Turnips

White-fleshed turnips can be grown over a wider range of conditions than swedes or yellow-fleshed turnips. They develop more rapidly and a succession of sowings provides supplementary feed in summer through to winter. Green Globe is the hardiest variety, and if not sown unduly early, keeps well into winter even in the cold, dry regions. Red Globe and Purple Globe mature earlier, and are useful sorts for summer or autumn feeding. Their production of leafage is high. York Globe is the most rapid grower of the turnips and under favourable conditions it can be fed off in 10 to 12 weeks. When sown in autumn it keeps well into winter under dry conditions. It is most useful for succession sowings and for making extra provision should the swede crop meet with mishap.

If it were realised that a turnip seed in 5 months increases to some 6 lb. in green weight (about a million times its original weight), possibly greater care would be exercised in growing this important crop. A long fallow is desirable; the poorer the soil type is the longer the fallow should be. Cultivation, adequate fertilising, and good inter-cultivation pay off. No root crop tolerates crowded growing conditions. Generally more poor crops result from the sowing of too much seed than from too little.

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Crossbred Beef Production

By D. E. WALKER,
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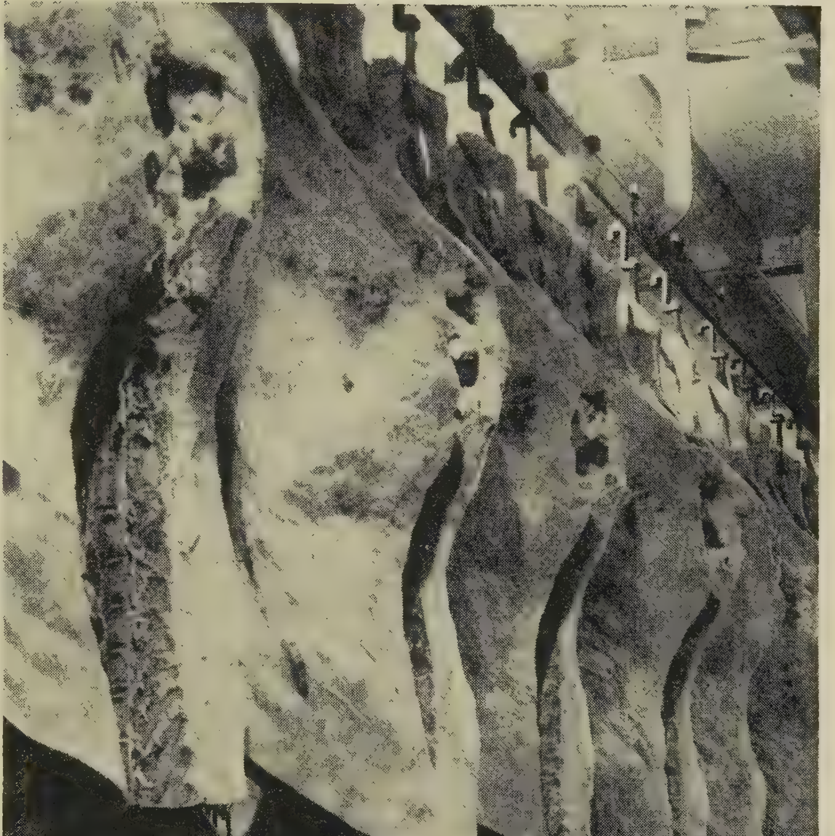
OVER the last 12 months prices for dairy produce have been falling, prices for beef have been rising, and the chairman of the New Zealand Dairy Products Marketing Commission has recommended dairy farmers to use 10 per cent of their cows to rear vealers. If this advice is taken, the inevitable crop of dairy-type vealers this year should, with forethought, be followed by a crossbred crop next year. Almost certainly these calves will not all be killed as vealers. Some are sure to survive for the beef market, so this report on Ruakura's work with crossbred cattle may be of some interest to both dairy and sheep farmers.

ORIGINALLY we started this work to investigate the possibilities of increasing beef production by way of the dairy herds. Since the Aberdeen Angus is the most popular beef breed and the Jersey the predominating dairy breed, we began with the cross of these two breeds.

P. Radford's report to the 1954 Ruakura Farmers' Conference on the Aberdeen Angus x Jersey for vealer production told briefly how prime-quality light vealers, which were meaty and white fatted, could be produced at 18 weeks by bucket feeding crossbred calves. In 1956 a further report was presented by Dr C. P. McMeekan [Superintendent, Ruakura Animal Research Station] on the value of this cross for chiller beef production.

A trial shipment of chilled carcasses sent to Smithfield for comment evoked a sufficiently encouraging report for us to carry the work a step further and test the merits of different breeds as sires. To this end we mated Jersey heifers to Aberdeen Angus, Polled Hereford, and Shorthorn bulls. Unfortunately the number of heifers available and the number of calves we could rear restricted us to using one bull of each breed. However, each was carefully selected for good beef type.

The calves were born without undue trouble and 10 of each cross were reared. The Aberdeen Angus cross



Crossbred carcasses at Horotiu freezing works.

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* This report was presented at the 1958 Ruakura Farmers' Conference.

and the Shorthorn cross groups consisted of 3 steers and 7 heifers each. The Hereford cross group was made up of 7 steers and 3 heifers. The calves were bucket fed twice daily and weaned at 8 weeks. Table 1 shows their rations.

TABLE 1—CROSSBRED CALF RATIONS

Age weeks	Pints per feed Whole milk	Skim milk	Total
0-1	3	—	3
1-4	2	4	6
4-8	—	9	9
Total fed ..	16 gals.	84 gals.	

Individuals at about 8 weeks are shown in the illustrations at right.

After weaning, the calves were transferred to the sheep farm and handled as beef cattle. They had a fairly hard time during the first autumn and winter. Owing to feed shortages they had to be grazed out and spent some time on the Raglan hill country and a subsequent period on a block of newly developed peat land. In their second year they were more favourably treated and were fit to slaughter just before they were 2 years old.

Table 2 shows some of the liveweight data. For the benefit of beef producers the weights of a roughly comparable group of Aberdeen Angus steers have been included. The steers had had slightly better treatment up to 10 months, but had not had the topping off given the crossbreds just before 2 years.

TABLE 2—LIVEWEIGHT

Breed	8 weeks lb.	10 months lb.	2 years lb.
Aberdeen Angus x Jersey (mixed sex)	144	351	880
Hereford x Jersey (mixed sex) ..	146	343	869
Shorthorn x Jersey (mixed sex) ..	144	391	932
Aberdeen Angus (steers)	—	448	913

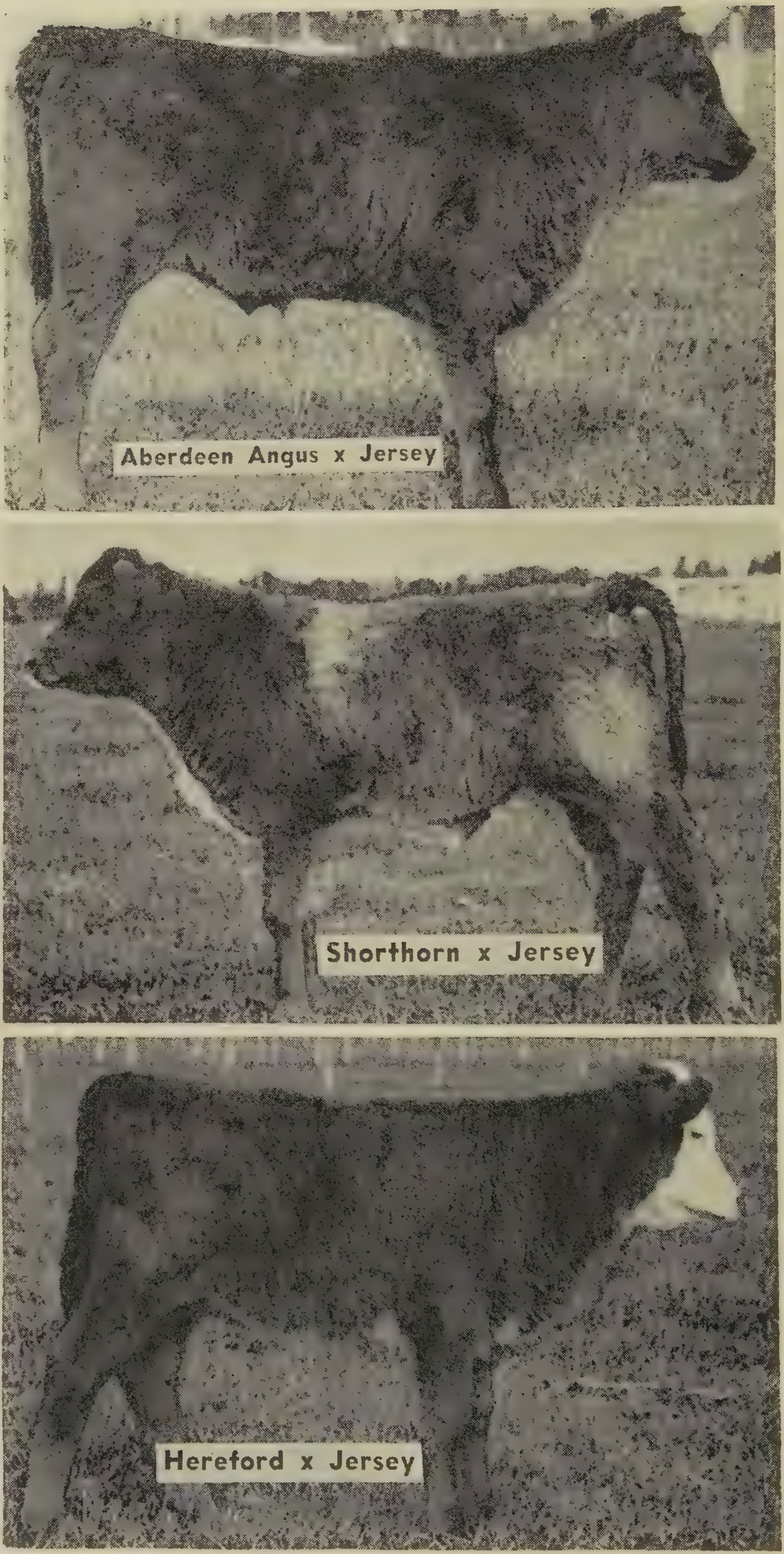
The crossbreds weighed some 20 lb. more than straight Jersey calves at 8 weeks. The 10 months' weights of the crossbreds were lower than they would have been had this line been reared as vealers. Our previous Aberdeen Angus x Jersey bucket reared, early weaned calves weighed 430 lb. at this age and some years ago a group single suckled by heifers weighed 480 lb.

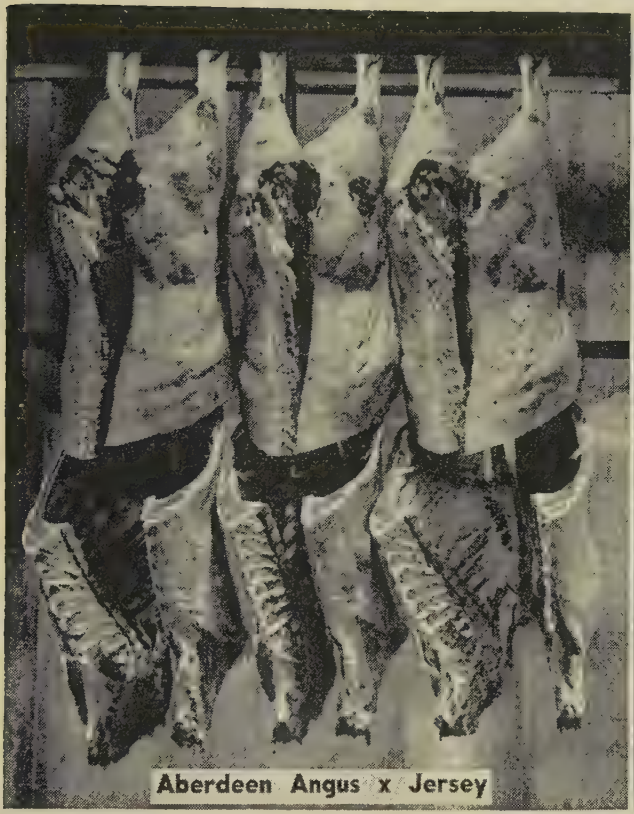
Liveweight, of course, is not everything, and though the quality angle may have slipped into the murk for the moment, it should not be completely disregarded. The Shorthorn cross cattle were the heaviest, but their conformation was the poorest. They were leggy and poorly developed in the buttocks.

Some of the heifers just before slaughter are shown in the illustration on page 311.

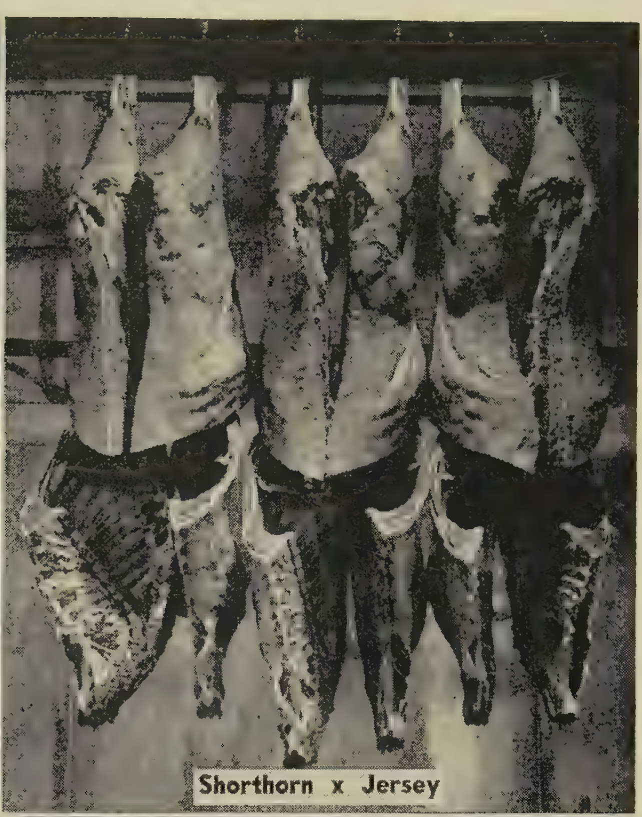
One heifer of each group was slaughtered for exhibition at the 1957

JERSEY CROSS CALVES (8 WEEKS)





Aberdeen Angus x Jersey



Shorthorn x Jersey

field day of the Ruakura Farmers' Conference. The remaining 9 of each group were slaughtered at the Auckland Farmers' Freezing Company's works at Horotiu in July 1957. Their average carcass weights are shown in Table 3.

TABLE 3—CARCASS WEIGHTS

Breed	Steers	Heifers
	lb.	lb.
Aberdeen Angus x Jersey	508	457
Hereford x Jersey	504	411
Shorthorn x Jersey	519	487

Though the weights were lighter than we expect from 2-year-old beef cattle, they are useful weights for the British trade.

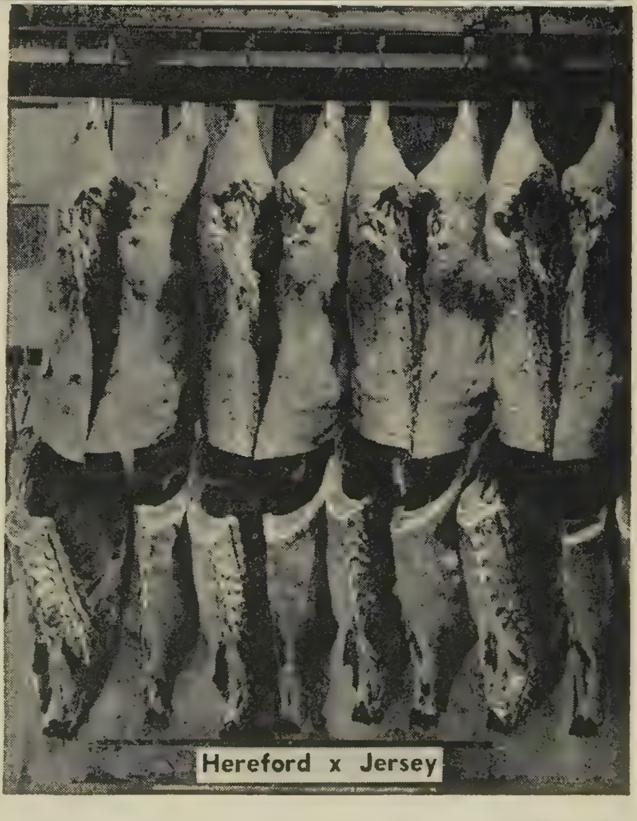
Some of the carcasses at Horotiu are shown on page 307. The Aberdeen Angus cross carcasses tended to be wasteful and to have uneven distribution of fat, but otherwise they were usefully meaty bodies, though appearing a little coarse for their size and weight. They cut well, showing a good eye of meat.

The Hereford cross line was very even in conformation and smooth in finish. There was obviously going to be little waste in cutting. The carcasses were, perhaps, not quite as well developed in the buttocks as the Aberdeen Angus cross group, but appeared well developed in proportion to their weight. They also quartered well.

The Shorthorn cross carcasses were finer in the bone and longer in the leg. Their fat cover was also uneven. On quartering they showed a shallower eye of meat, but had the best marbling of fat in the muscle.

Grading

The carcasses were graded by the New Zealand Meat Producers Board grader at Horotiu. Results are shown in Table 4.



Hereford x Jersey

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Sheep Branding Fluid
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You'll get your branding done the quicker, easier, more successful way if you brand with economical VACMARK. Four clear, bright colours—approved as a Wool-marking preparation under the Stock Act 1908 and its amendments—give you legible markings that really last . . . yet they wash out with no trouble in scouring operations. No staining, no damage to the wool either—with VACMARK. *Available from all stock and station agents. Order yours now!*

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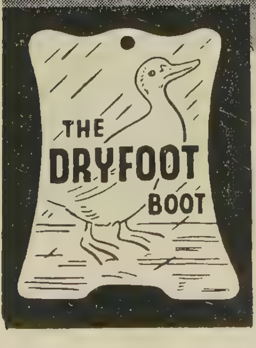

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Your choice of Sherpa Commando rubber soles, nailed leather soles and comfortable Avaflex rubber soles. Wherever you buy working boots you'll buy the Dryfoot with the duck on the tag.

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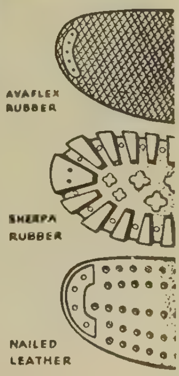


Crossbred heifers just before slaughter.

TABLE 4—GRADING

Breed	Chiller	Freezer
Aberdeen Angus x		
Fores	7	2
Hinds	6	3
Hereford x		
Fores	9	—
Hinds	9	—
Shorthorn x		
Fores	7	2
Hinds	5	4

The Aberdeen Angus cross carcasses were down graded mainly on account of their wastefulness and uneven fat cover. One was penalised for fat colour as well. Of the Shorthorn cross carcasses two bodies were described by the grader as "bad type generally" and the other down-graded hinds were designated "cowy".

Apart from one slightly yellow Aberdeen Angus cross body the fat colour was good. There was no suggestion of the bright yellow colour characteristic of Jersey fat. There was one fault common to all carcasses: excessive kidney and channel fat. However, this fault has the advantage that it can be easily remedied by trimming if necessary.

Smithfield Comments

The carcasses were all shipped to Smithfield for criticism by trade experts. Though most of the carcasses were graded as chillers, all were frozen for export, as this was the most expeditious way to send them.

They arrived on the Smithfield market in very good order and were inspected by members of various firms operating on the market, by staff of the New Zealand Meat Board, and by others with trade interests.

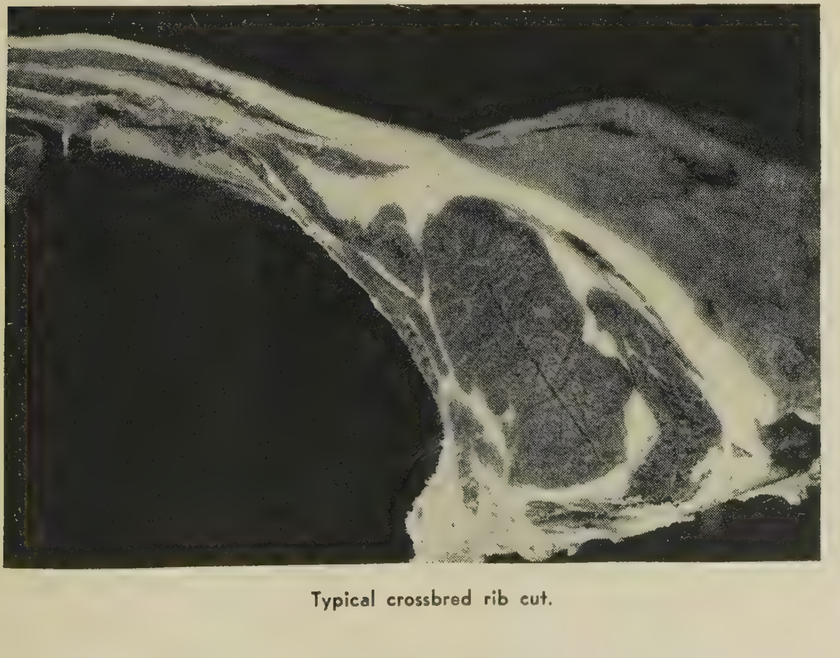
Generally opinions were very favourable. Even those who had previously expressed prejudice found little fault. The weights were declared very acceptable, light-weight carcasses being readily saleable. The eyes of meat in the rib cuts and the colour and texture of muscle were described as good and the marbling as "good for their age".

Freezing had modified any slight yellowness in fat present earlier and all carcasses appeared very white for the first few hours they were on display. As they thawed out a little, traces of colour began to show. The opinion was expressed that "a probable increase in colour on defrosting would be an advantage". This brings to mind the comment on the previous shipment of chilled Aberdeen Angus x Jersey bodies to the effect that they showed "a nice ripe colour reminiscent of home-killed beef". This suggests that since such a high proportion of British home-killed beef is derived from dairy cows (though not Jerseys), the market is coming to expect a certain amount of colour in fat and whiteness is no longer desired.

The excessive kidney and channel fat was, of course, adversely commented on and the suggestion was made that if large numbers of crossbreds were ever shipped, it might be advantageous to remove the kidney knobs first. The "wastiness" of some of the Aberdeen Angus cross carcasses was noted, but otherwise fat cover was deemed good.

On the whole **conformation** met with approval. The main points of criticism were the legginess apparent in the Shorthorn cross group and the slight lack of flesh over the ribs in all groups, which resulted in a "shelliness" in the forequarters. However, this last point was regarded by several as an advantage in that the lower-priced fore-ends were light. Further approval was expressed that the forequarters were not too deep and that there was little waste on the briskets.

On the question of breed, and disregarding sex, voting was heavily in



Typical crossbred rib cut.

favour of the Hereford cross group on account of their uniformity of conformation, evenness of finish, and lack of waste. When asked to judge the heifers independently some critics preferred the Aberdeen Angus cross heifers to the Hereford cross heifers, a point with which we agreed at this end on our block-test measurements. The Shorthorn cross groups were unanimously placed last on account of their poor conformation.

Desirable Cross

On the subject of breed it seems a little invidious to draw conclusions based on the use of one sire and a small number of progeny. However, the Hereford cross carcasses were so striking in their uniformity and general appeal that this breed seems well worth perservering with if there is to be any future for crossbreeding. A secondary advantage is that progeny of this cross are clearly colour marked.

Though the Aberdeen Angus cross took second place in these results, they were still useful beef animals and the grossness apparent in some of the carcasses could, perhaps, be attributed to earlier maturity. In the past the cross has been found to provide an acceptable carcass and the evidence from this trial would not suggest that the use of the breed for crossing should be completely abandoned. Since Aberdeen Angus are more numerous in New Zealand than are Herefords, good sires of this breed are more easily obtainable. A good beef-type sire is more important than its breed.

Our results show little to recommend the Shorthorn. We may have been unlucky in our choice of bull, but he was a good beef type from a reputable stud. His progeny grew the heaviest, but their carcasses made little appeal to the trade. Possibly there will be little temptation to use this breed, which is numerically in a minority among our beef cattle.

No Pampering

It is noteworthy that the animals in this experiment were not pampered during their early life, but even so ultimately produced a type of carcass which attracted favourable comment. Probably, if they had had rather better conditions, they would have been marketable at 18 months at much the same weights. This should be the objective to fit in with our feed conditions. However, the evidence shows that good beef, readily acceptable on the British market, can be produced cheaply from our dairy herds if the demand warrants it.

Agricultural and Pastoral Show Dates

THE following are dates and venues of A. and P. shows up to the end of February:

NORTH ISLAND

November

30, 31 October and 1 November—Waikato A. and P. at Hamilton.
31 October and 1 November—Wairarapa and East Coast P. and A. at Carterton.
5 November—Waikato Central A. and P. at Cambridge.
*7 and 8 November—Manawatu and West Coast A. and P. at Palmerston North.
7 and 8 November—Whangarei A. and P. at Whangarei.
8 November—Tokoroa A. and P. at Tokoroa.
8 November—Clevedon A. and P. at Clevedon.
*14 and 15 November—Wanganui A. and P. at Wanganui.
15 November—Bay of Islands P. and I. at Waimate North.
15 November—Waihi A. and P. at Waihi.
*21 and 22 November—Egmont A. and P. at Hawera.
22 November—Rotorua A. and P. at Rotorua.
27, 28, and 29 November—Auckland A. and P. at Auckland.
*28 and 29 November—Stratford A. and P. at Stratford.

December

6 December—Helensville A. and P. at Helensville.
6 December—Kaikohe A., P., and H. at Kaikohe.
*6 December—Hauraki A. and P. at Paeroa.

January

1 January—Nuhaka A. and P. at Nuhaka.
17 January—Central Hawke's Bay A. and P. at Waipukurau.
*23 and 24 January—Feilding I., A., and P. at Feilding.
23 and 24 January—Wairoa County A. and P. at Wairoa.
28 January—Marton District A. and P. at Marton.
*30 and 31 January—Horowhenua A. and P. at Levin.
31 January—North Kaipara A. and P. at Paparoa.

February

6 and 7 February—Taumarunui District A. and P. at Taumarunui.
6 and 7 February—Rodney A. and P. at Warkworth.
7 February—Rangitikei A. and P. at Taihape.
7 February—Woodville A. and P. at Woodville.
*10 and 11 February—Dannevirke District A. and P. at Dannevirke.
11 February—Te Awamutu A., P., and H. at Te Awamutu.
13 and 14 February—Ohura A., P., H., and I. at Nihoniho.
13 and 14 February—Taranaki A. and P. at New Plymouth.
14 February—Otorohanga A. and P. at Otorohanga.
14 February—Pahiatua A. and P. at Pahiatua.
14 February—Opotiki A. and P. at Opotiki.
19 February—Matamata A. and P. at Matamata.
*20 and 21 February—Masterton A. and P. at Masterton.
20 and 21 February—Te Kuiti and District A. and P. at Te Kuiti.
20 and 21 February—Franklin A. and P. (70th Annual Show) at Pukekohe.
21 February—Northern Wairoa A. and P. at Mititai.
21 February—Whakatane A. and P. (50th Jubilee) at Whakatane.
25 February—Morrinsville A. and P. at Morrinsville.
27 and 28 February—Wellington and Hutt Valley A. and P. at Trentham.
*28 February—Waimarino A., P., H., and I. at Raetihi.
28 February—Putaruru A. and P. at Putaruru.
28 February—Te Puke A. and P. at Te Puke.

SOUTH ISLAND

October

18 October—Ellesmere A. and P. at Leeston.
25 October—Northern A. and P. at Rangiora.
31 October and 1 November—Timaru A. and P. at Timaru.

November

1 November—Amberley A. and P. at Amberley.
*6 November—Ashburton A. and P. at Ashburton.
7 and 8 November—Marlborough A. and P. at Blenheim.
*12, 13, and 14 November—Canterbury A. and P. at Christchurch.
15 November—West Otago A. and P. at Kelso.
15 November—Taieri A. and P. at Outram.
*19 November—North Otago A. and P. at Oamaru.
21 and 22 November—Nelson A. and P. at Richmond.
22 November—Courtenay A. and P. at Kirwee.
22 November—Waimate A. and P. at Waimate.
22 November—South Otago A. and P. at Balclutha.
29 November—Motueka A. and P. at Motueka.
29 November—Tokomairiro A. and P. at Milton.

December

*2 and 3 December—Gore A. and P. at Gore.
6 December—Wyndham A. and P. at Wyndham.
6 December—Otago Peninsula A. and P. at Portobello.
*9, 10, and 11 December—Southland A. and P. (Royal Show) at Invercargill.

January

10 January—Blueskin A. and P. at Waitati.
17 January—Waikouaiti A. and P. at Waikouaiti.
24 January—Waiau A. and P. at Tuatapere.
27 and 28 January—Otago A. and P. at Dunedin.
31 January—Banks Peninsula A. and P. at Little River.

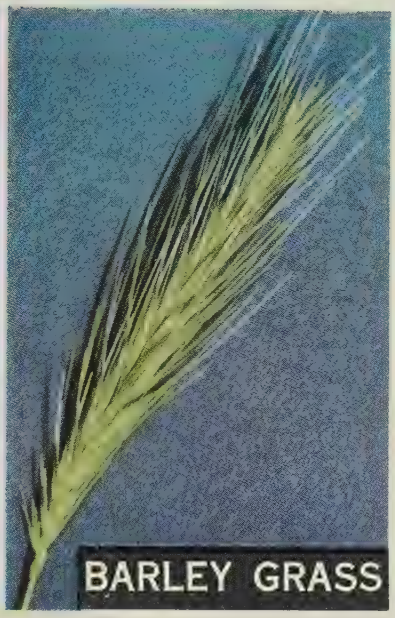
February

14 February—Inangahua A. and P. and Sports Association at Reefton.
*14 February—Central Otago A. and P. at Omakau.
*21 February—Maniototo A. and P. at Ranfurly.
21 February—Murchison A. and P. at Murchison.
*28 February—Kaikoura A. and P. at Kaikoura.

* The Department of Agriculture exhibit will be staged at this show.

WEED IDENTIFICATION AND CONTROL

This is one of a series of articles illustrated in colour to appear in the "Journal" from time to time in which identification and control of various weeds will be discussed.



By D. I. GLUE, Instructor in Agriculture, and L. J. MATTHEWS, Weeds Research Officer, both of the Department of Agriculture, Wellington

BARLEY grass (*Hordeum murinum*) is a vigorous, free-seeding annual grass that has become a serious pasture weed during the last few years. It is most aggressive on soils of medium to high fertility and is very troublesome on hill-country sheep farms in districts, such as Hawke's Bay, where the soil fertility has been built up by the increased use of subterranean clover and white clover but the pastures still open up badly during the frequent dry summers.

BARLEY grass is a weed of major importance for two reasons:

1. It is relatively unpalatable, particularly when mature, forming a dense mat of unusable herbage which smothers out desirable pasture species and creates conditions suitable for the perpetuation of the infestation. It is encouraged by any opening or weakening of the sward, due to factors such as summer drought, stock trampling, or excessive haying, and often becomes completely dominant on areas where the fertility has been raised by the congregation of stock, such as under shade trees and alongside shelter belts.

2. The seeds have long, barbed awns and get into the hooves and wool of sheep, cause injuries to their eyes and mouths, and damage or puncture the pelts. Sheep dogs may be lamed by seeds working up between their toes.

Control Measures

Barley grass seeds germinate at any time from early autumn to spring, though the main strike of seed is in autumn. Plants can remain in pastures only by establishing each year from seed, and the seedlings are unable to establish unless the sward is weak and open. Control should be sought along two lines, and for full effect these measures should be carried out concurrently:

Barley grass often becomes dominant under shade trees where the fertility has been raised and the ground bared by the congregation of stock.

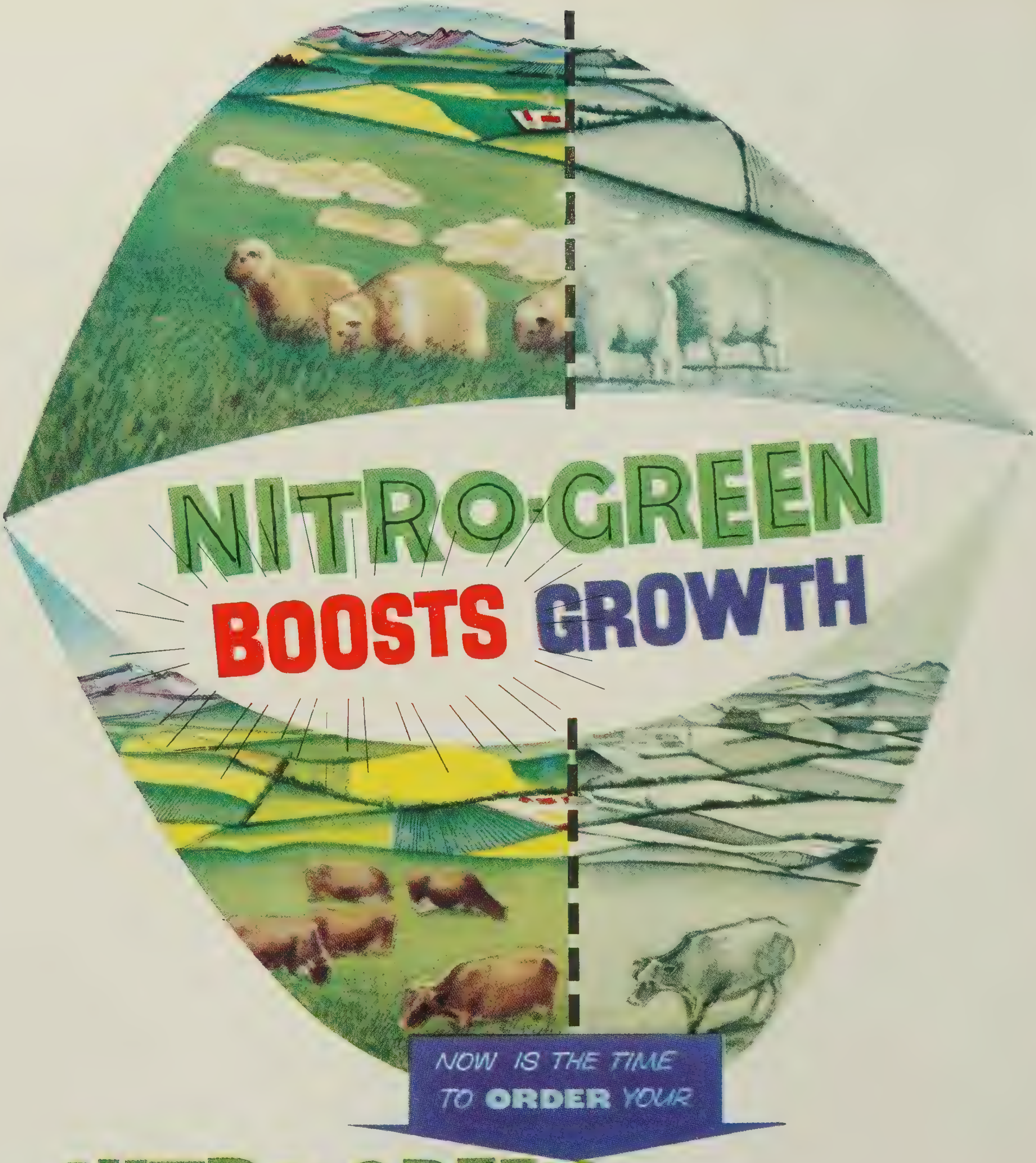
1. Increasing the resistance of the sward to barley grass invasion by applying fertiliser, oversowing or sod seeding, and adopting other pasture-management practices that lead to a dense and vigorous turf.

2. Chemical control of established areas to kill existing plants before they can set seed: Very satisfactory results have been obtained from late autumn-early winter application of TCA at from 10 lb. to 15 lb. per acre. By this period the greatest percentage of barley grass has struck from seed and the rates of TCA recommended are sufficient to kill any seedlings striking for about a month after application. TCA at 10 lb. to 15 lb. per acre has no lasting detrimental effect on clovers or established ryegrass and cocksfoot. Dalapon has also proved successful at rates of 1 to 2 lb. applied just before early flower head formation. At this stage of growth barley grass is readily identifiable in a pasture. For this reason the use of dalapon is more practical. If dalapon is to be used, the rates of 1 to 2 lb. per acre should not be exceeded, as otherwise associated useful species will be seriously damaged. For this reason also dalapon should be used only in spring, because then its effect on valuable grasses is much less severe than in late autumn or early winter.

The difficulty is to arrest further re-infestation. If TCA is employed, clovers and fertiliser should be oversown at the time of its application. If dalapon is used, grasses and clovers and fertiliser may be sown at the time the weedkiller is applied, provided wet weather is unlikely to be experienced for several days after the application. If rain follows the application, dalapon may be washed into the soil and affect the germination of the grasses.

The oversowing of clovers and grasses is an important step in barley grass control. The chemicals used for barley grass control will kill only the plants which have germinated at the time of application, or those germinating soon after, and subsequent re-infestations will occur if the bare ground is not covered with some desirable pasture species.

Though there may be no sign of barley grass in the pasture in spring, seeds lying dormant in the soil are quick to take advantage of any opening up in the sward due to a dry summer by germinating thickly with the first autumn rains. Farmers should learn to identify the plant while it is still in the very young stages, so that control measures can be begun without delay. Fortunately even in the early stages of growth barley grass is easily identified by the very large auricles which project from the base of the blade to clasp the stem. Though some other pasture grasses, such as perennial ryegrass, also possess auricles, the distinctive shape and large size of barley grass auricles are unmistakable identification features.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Stabilisation of Sand Drifts with Blue Lupins

By H. C. H. PEARSE,
District Soil Conservator, Department of Agriculture, Palmerston North

SOIL Conservation Officers of the Department of Agriculture have proved that the ordinary bitter blue lupin will establish well when drilled, grow vigorously without fertiliser, and reseed freely on loose, windblown sand of any depth. This discovery is likely to bring about a revolution in the methods hitherto used in stabilising sand drifts, sand dunes, and loose sand generally. The bitter blue lupin is the one frequently recommended to gardeners as a green manure crop and used for this purpose at times by orchardists. Some arable farmers grow it as a fodder crop or as a seed crop, when often it is also fed off.

THERE are several hundred thousand acres of sand country along the west coast of the North Island, extending in many places 8 to 10 miles inland, and many thousands of acres of land derived from windblown sea sands in various places along the east coast of both islands. Most of this country has been successfully developed as farm land and is growing satisfactory pastures; much of it is not now readily recognised as being derived from sea sand.

However, throughout these sandy soils, especially near the coast, there are extensive areas where the vegetation has been destroyed in one way or another and sand blows have developed. In many places the loose sand is piled up into massive moving dunes and in others into extensive sand drifts. Throughout the coastal sandy areas there is an ever-present danger that unless the sand is stabilised, strong prevailing winds from the sea will start the sand moving again, resulting in extensive blowouts, sand drifts which cover valuable land, and the building up of moving sand dunes. This could result from destruction of the vegetation and humus holding the soil by overcultivation, cultivation of dry ridges, overgrazing by stock or rabbits, or fire.

Trouble Spots

Stabilising of bare sand in coastal areas falls into two distinct categories: (1) That in which movement of the foredune must be checked. (2) That in which movement further inland of topsoil over relatively consolidated sand and then of the underlying sand must be prevented.

Foredune Problem

On the exposed coastal strip or foredune the main source of moving sand is beaches from which sand is continually blown inland. It tends to pile up in dunes which make up the area known as the foredune complex. In the absence of stock a natural cover developed on these dunes and sand flats. The grass *Spinifex hirsutus* held the seaward sides and tops of the front dunes, and marram grass followed by tree lupin the inland areas. Eventually these species gave way to other shrubs and to climbers and the typical cover of the sand dune country developed.

With the building up of a stable foredune of sufficient height (generally where exposed to strong winds some 15 to 20 ft.) little if any beach sand continues to be blown inland, the foredune tending to be built out toward the sea. If, however, the binding vegetation, especially the spinifex, which is readily eaten by stock, is destroyed, the foredune is soon torn down by wind and the sand is blown inland to smother and destroy the marram grass and lupins.

If this erosion is not arrested, sand moves much further inland, the supply of sand being continually augmented from the beach.

Inland Sand Problem

On relatively stable consolidated sand country inland from the foredune the underlying sand is little different from that nearer the sea and if the topsoil is removed, the sand will blow with the wind just as freely, building up into moving dunes or extensive sand drifts and covering stable and improved areas. Windward areas then tend to become stable as the sand is blown away, but the loose sand continues to move in the direction of the wind.

Until recent years sand stabilisation has been done mainly to protect important public utilities such as roads, railways, navigable rivers, buildings, or valuable land. The work has been carried out as public works or by those controlling seaside resorts, though on many farms on sand country much

Sand dune area 10 days after blue lupins were drilled in; young seedlings in foreground. The blackish ironsand is typical of that which occurs extensively on parts of the west coast of the North Island.

The area at left 4 months later. This illustrates the quick establishment so essential for sand stabilisation.

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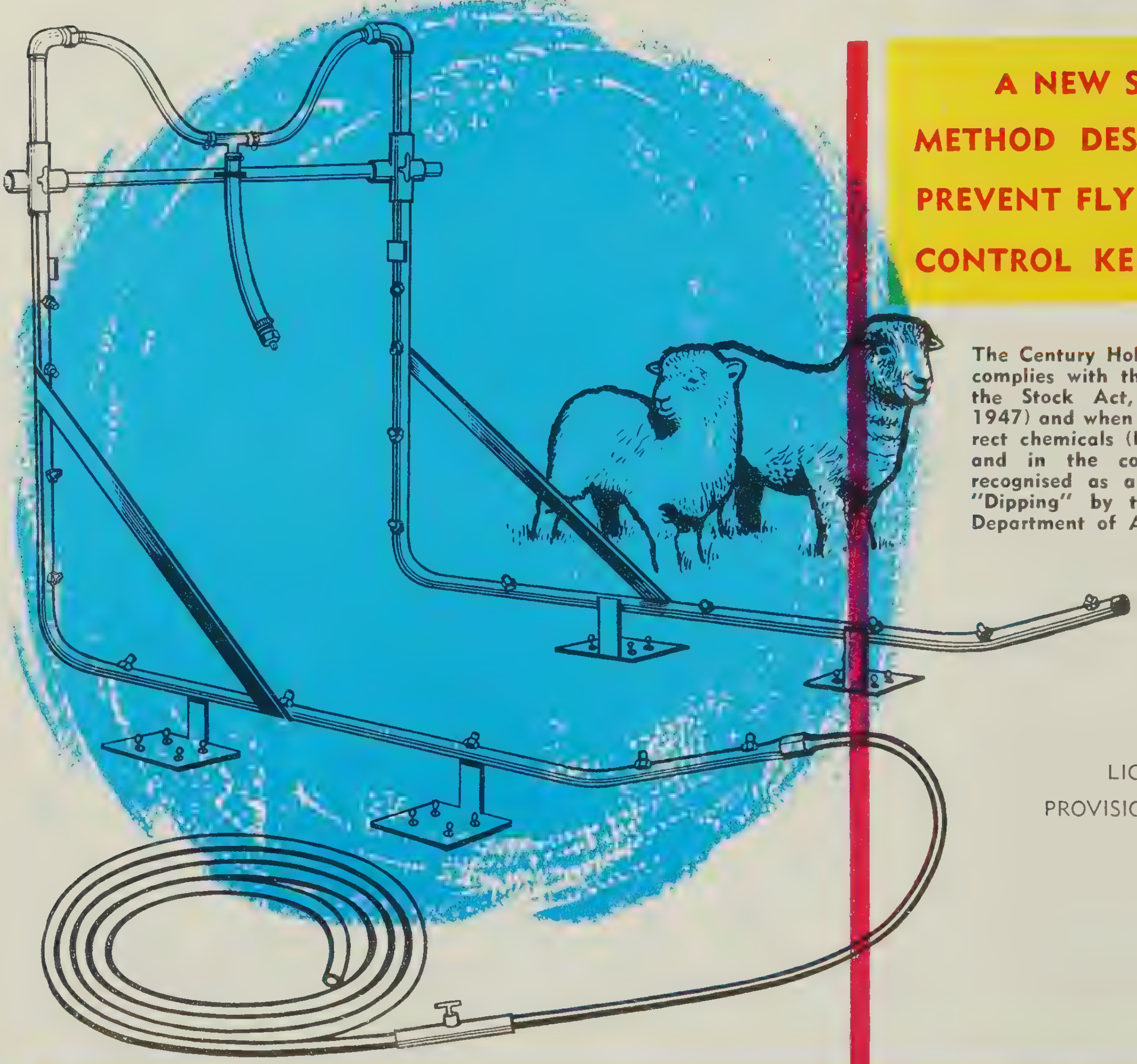

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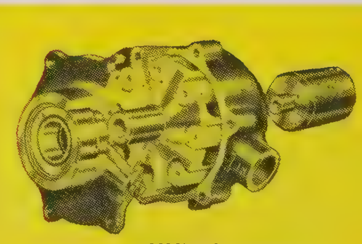

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Excellent strike of blue lupins 10 days after seed was drilled.

A striking contrast that shows the type of raw sand that was stabilised and strong growth of lupins on this ironsand.

useful work has also been done in the more inland areas in stabilising both sand dunes and sand drifts and in protecting areas, such as the higher sand ridges, likely to cause trouble on farm lands.

The usual procedure to counter sand movement due to breakdown of the foredunes has been to start at the sea front by building up a new foredune area. Sand-catching brush or a similar type of fence is erected to collect the sand as it is blown in, new fences being placed above the older ones as they are covered until the foredune reaches the necessary height. These foredunes are best stabilised initially by planting spinifex, the only suitable sand-binding plant, on the seaward side and along the tops and marram grass on the inland areas of bare sand. Then follows the establishment, generally by seeding, of tree lupin and later tree planting, mainly *Pinus radiata*.

For big areas of moving bare sand further inland stabilisation has been effected by planting marram grass in closely spaced rows on the windward side of the areas, the planting being extended toward the crest of the dunes or the moving front of the drift when the first plants become effective in holding the sand. Such plantings have been followed in less exposed situations by tree planting and in others by seeding with tree lupin, which is often replaced by planting trees or, eventually, developing pasture.

Farmers have generally followed the same methods as those used by the Ministry of Works, the New Zealand Forest Service, and local bodies, but they have tended to aim eventually at establishing pastures on the lower areas after stabilisation and to use trees on the higher and drier ridges. Much stabilised sand country, however, has been left to revert to tree lupin.

Blue lupins in flower 5 months after drilling in autumn. August sowing has given better all-round results than autumn sowing, but is risky if September is dry and windy. In the warmer districts autumn sowing is therefore preferable.

The methods of stabilising sand just described are very costly in manpower for marram grass planting, tree lupin seed is expensive because it has to be gathered by hand, and development of conditions suitable for pasture establishment is very slow. The replacement of tree lupin, whether sown or volunteer growth, is also expensive.

Little wonder then that progress in sand stabilisation in the many areas of bare and moving sand along the coasts has been slow and work has been directed chiefly to the protection of valuable property.

Soil Conservation Problem

Stabilisation of windblown sand and protection of sand country liable to suffer severely from wind erosion are among the problems of soil conservation. In the hope of reducing the cost of stabilisation work and of speeding up the job of getting windblown sand country back into production the Department of Agriculture's soil conservation staff in the Manawatu and Rangitikei districts (where there are about 150.000 acres of sand country) began a search for plants likely to be effective for holding sand.

Among the many plants tried for quick establishment on bare windblown sand the bitter blue lupin was by far the most promising. It was much superior to ryecorn, which has been used successfully for the same purpose, in Victoria especially. Blue lupins when drilled either in autumn, when the sands are wet, or in early spring established quickly and were sufficiently well grown by the time the sands dried out to prevent further movement on the areas planted.

Blue lupins must be drilled across the direction of the prevailing wind, as otherwise wind funnels develop

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along the rows, causing blowouts. If autumn sown, lupins flower in early summer, and a little later when spring sown. In both cases seed is set freely. If left, the dead stubble continues to give excellent protection during the hottest and driest months. The fallen seed germinates well among the litter with the autumn rains, though it is best to disc it in.

After the discing in of the seed crop or the seed fallen to the ground, where a seed crop has been harvested, areas can be sown to pasture or planted in trees without further delay. Where early autumn rains germinate the lupin seed from this first crop the lupins can be fed off by sheep and the grass seed sown and tramped in at the same time or soon after feeding off.

The second lupin crop gives excellent protection, provided it is not allowed to become too dense and high. The dead stems and trash also give good shade and protection during the next summer if the area is not grazed too hard or continuously. It was this experience in small-scale trials with blue lupins which led to the next step, practical application on farm lands.

Trials in Manawatu and Rangitikei

The first extensive sowing of blue lupin on loose windblown sand was made in the Wanganui district where assistance was requested in the stabilisation of some 200 acres of moving sand dunes on a 500-acre property. A dune of about 50 acres was selected to try ordinary blue lupins instead of the usual marram grass planting. This was a gently rolling dune which was fairly even in contour, but exposed to the prevailing westerly winds.

In May 1953 blue lupins were drilled into the sand at 2 bushels per acre. The lupins struck well and by early spring had completely stabilised the area. The crop was allowed to go to seed and in February 1954 yielded 750 bushels of seed when harvested with the header. The trash maintained sufficient cover to hold the sand during the dry weather of late summer and the fallen seed produced a dense second crop. This was fed off in April, when a ryegrass - cocksfoot - white clover pasture mixture was broadcast and trampled in with sheep. Though open the first year, this area has developed into a satisfactory pasture which should hold the sand and with careful management and topdressing should improve in this respect.

The next year similar treatment of another large sand dune was undertaken, about 1,000 bushels of lupin seed being harvested. This provided sufficient for still further work in stabilising the rest of the area and a surplus which had a ready sale at £1 per bushel. Though the dunes in this area were generally less exposed and contained more humus in places than those nearer the coast, this success from the use of bitter blue lupins was sufficiently encouraging to justify further work in other areas.

Ten acres stabilised with blue lupins 2½ months after the seed was drilled (above). Sown as recommended in this article lupins establish quickly and are sufficiently well grown (see below) by the time the sands dry out to prevent further movement of sand on the planted areas.

Other Trial Areas

During the past 2 years three more inland moving-dune areas have been treated by the lupin method; so far results have been very satisfactory.

Experience in dealing with these areas has shown that the following are important factors in securing really good results with blue lupins in stabilising sand dune areas:

Complete dunes must be treated in one operation starting from the seaward side, since sand blowing from untreated areas of a dune can smother the lupins.

Dunes should be as even as possible in contour to allow for even drilling and overall coverage with lupin seed.

If patches of vegetation such as marram grass occur, they should be removed to allow the sand to flatten out before drilling. If this is not done, wind channels can develop in which the lupins are scoured out.

For a really good cover in the early stages at least 3 bushels of lupin seed per acre should be sown at right angles to the prevailing wind. No gaps must be left, because these are danger spots. Extra seed must be available to redrill any weak areas to prevent windblow, and any difficult areas should be double drilled.

As both hares and rabbits, the former especially, can do a lot of damage to the seedling plants, leaving the ground without cover, they should be kept down.

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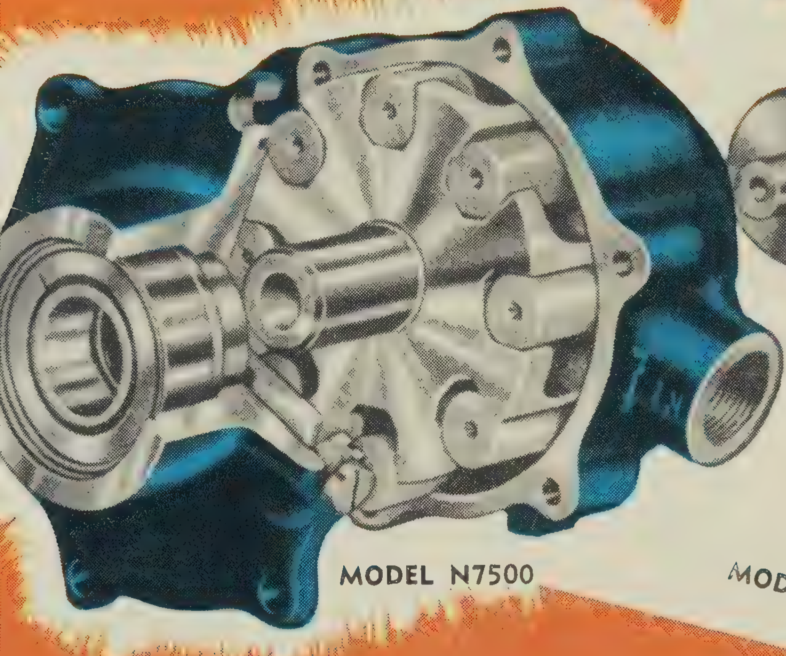
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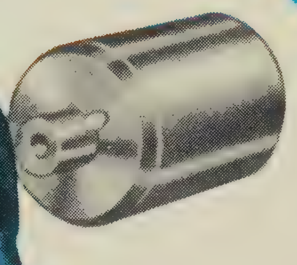

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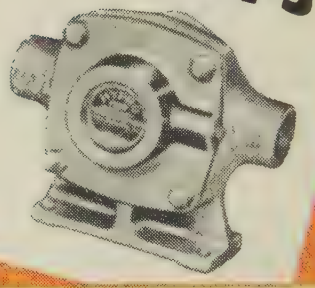
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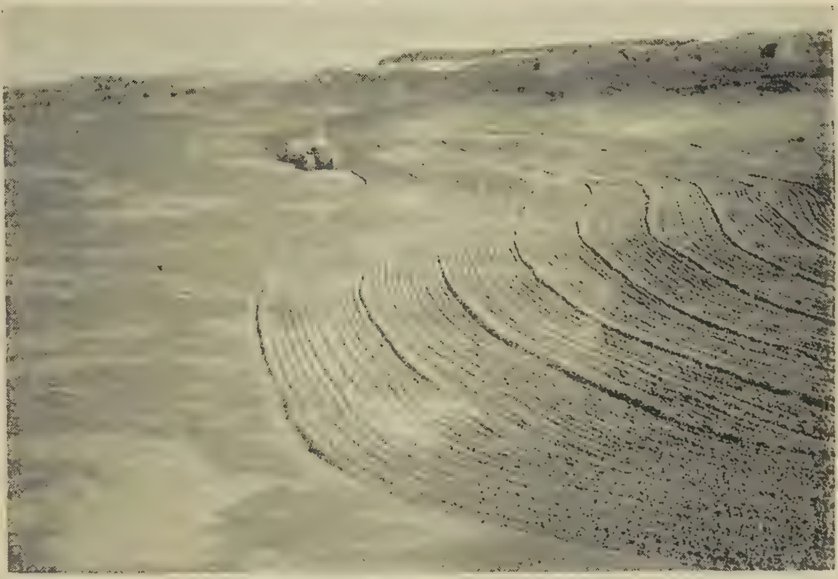
There is some choice in the time of sowing, though this must be done only when the sand is wet and likely to stay wet and not to blow for some weeks so that the seedlings can establish. To date autumn sowings as soon as the rains have consolidated the sand have been favoured, but cold, wet conditions in winter have caused a check in growth, resulting in severe damage by fungous diseases. Though sand stabilisation has not been affected, seed production has been reduced. Early spring (August) sowings, though more risky if a dry and windy September follows, have so far given better all-round results, the lupins coming away quickly at this time of year. In warmer districts autumn seeding would be preferable.

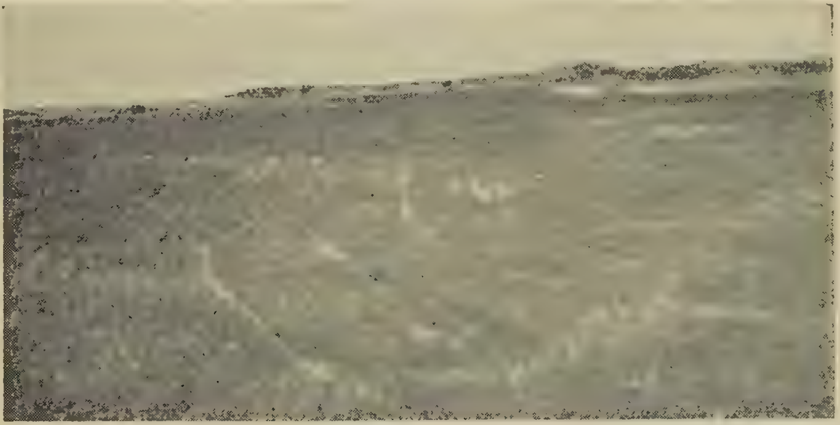
Where the sand dunes have built up into high ridges, with the tops fully exposed to the prevailing winds, it is advisable with the blue lupin method of stabilisation to start drilling on the windward side of the dune area, working up the slopes as far as there is a good chance of the lupins growing strongly enough to hold the sand. If sand to windward of the dune crests is stabilised with lupins, the crests will flatten out and within a season or two sowing of lupins can be continued over the crest and the area completed.

Blue lupins reseeding on sand country. The seed germinates well among the litter with autumn rains.

STABILISATION OF SAND DRIFTS WITH BLUE LUPINS



Drilling blue lupins into an 8-acre sand drift (above) and the area 4 months later stabilised by the lupins (below). Drilling must be done across the direction of the prevailing wind, as otherwise wind funnels develop along the rows, causing blowouts.



Availability of Seed

Adequate supplies of cheap lupin seed must be available if this method of sand stabilisation is to be widely adopted. Blue lupins are recognised as a tricky crop to harvest. If the crop is too immature, seed heats in the sacks and may be spoilt; if harvesting is delayed too long, much of the seed is lost through shedding.

To test further the practicability of growing seed on sand country 25 acres of run-out pasture on a light but stable sand flat was ploughed in winter and drilled at 2 bushels per acre without manure at the end of August. The crop established and grew well and was direct headed in February, giving a yield of 32 bushels of clean seed per acre, a total of 800 bushels. The area was then given a light discing and the fallen seed produced a dense second crop, which was fed off in June. This area provided an estimated 1,400 ewe grazing days per acre at a time when the feed was most valuable. Header harvesting was begun during a spell of hot, dry weather when most of the seeds in the pods were brown and firm.

The total expenditure for the 25 acres, including land rent at £2 per acre, seed at 30s. per bushel, cultivation at £5 per acre, and harvesting and use of sacks at £5 17s. per acre, amounted to about £400 or 10s. per bushel for the 800 bushels. By disposing of half the crop at £1 a bushel

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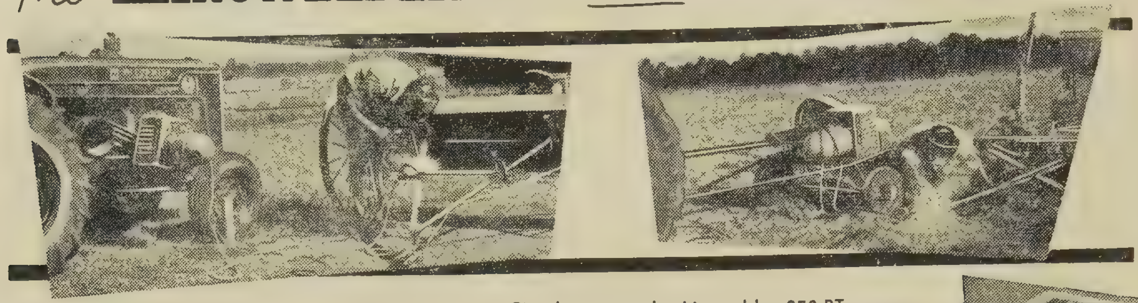

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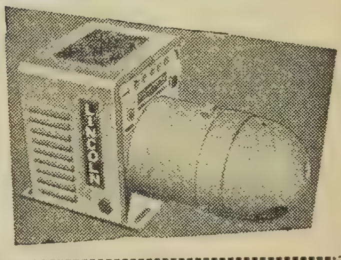

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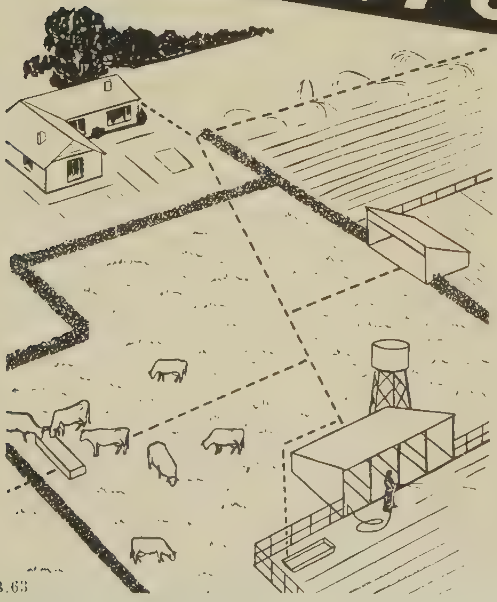

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a grower could get from 25 acres sufficient seed for a programme of stabilising between 100 and 150 acres at no cost in seed, and in addition he would have a valuable winter fodder crop.

By adopting a programme of harvesting seed in the first year, either from suitable areas of sandy flats or even from the areas being stabilised, and selling up to half the seed a farmer can reduce expenditure on sand stabilisation with blue lupins to the cost of the initial drilling plus the costs of pasture establishment after the second crop is fed off. The pasture-establishment costs are those for the grass seed mixture and fertiliser and broadcasting of these, as there is no need for further cultivation, except perhaps the use of chain harrows after broadcasting to get a better strike.

Application of Method

Experience to date has justified the opinion that of the plants available in this country for sand stabilisation on farm lands the bitter blue lupin is outstandingly effective in preparing windblown sand for regrassing; in addition it is revenue producing both as a source of cheap seed and in providing nutritious fodder for sheep and cattle when most needed.

No claim is yet made for the use of this plant in the stabilising of foredune country close to the sea, though the first work referred to in this article was done on dunes sloping toward the coast, fully exposed to the prevailing winds, and within a mile of the sea. The dunes were not, however, high. In later demonstration areas much higher dunes are being tackled in two or more stages, time being allowed for the tops to be blown off after stabilisation of the windward, lower slopes.

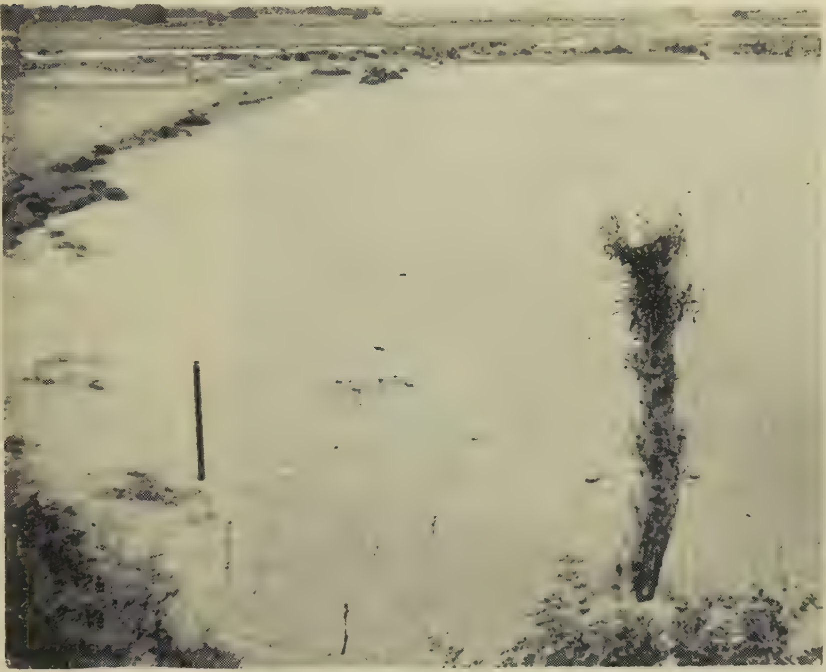
Until blue lupins have been tested fully on the more difficult, completely exposed seaward dunes (after the fixing of stable foredunes by spinifex and marram grass, which would be essential) it is recommended that spinifex and marram grass, plus trees, including tree lupin, should still be relied on for foredune work.

However, there are numerous areas, even in the foredune country, of relatively unstable sand where blue lupins could be used effectively and cheaply to stabilise areas temporarily and provide cover for the establishment of tree plantations if not of pasture.

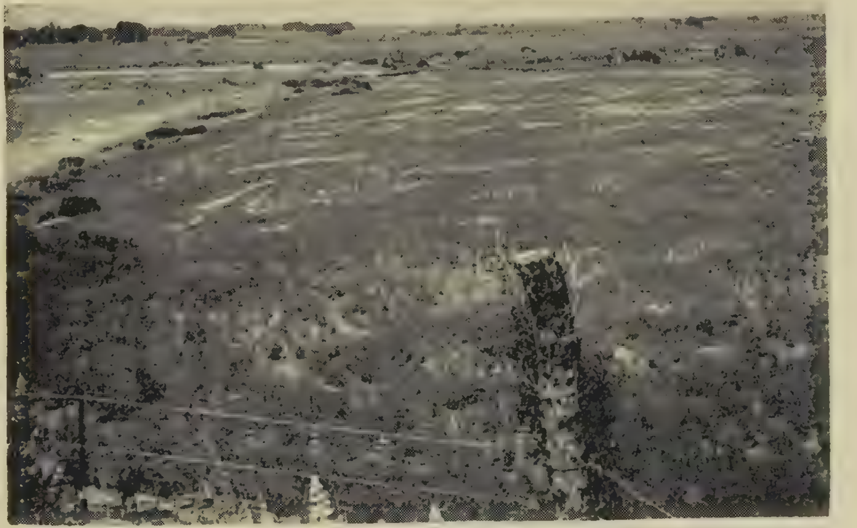
Future Work in Sand Stabilisation

Blue lupins have been proved really worth while for relatively cheap and quick stabilisation and eventual regrassing of much of the easier windblown sand dune areas. Their use can probably be extended to some of the more difficult seaward areas to assist establishment of grazing pastures or, particularly, to aid establishment of plantations and shelter belts.

STABILISATION OF SAND DRIFTS WITH BLUE LUPINS



Part of a 26-acre sand drift which threatened to block the Manawatu River (above) and the same area stabilised with blue lupins and ready to be developed into pasture (below).

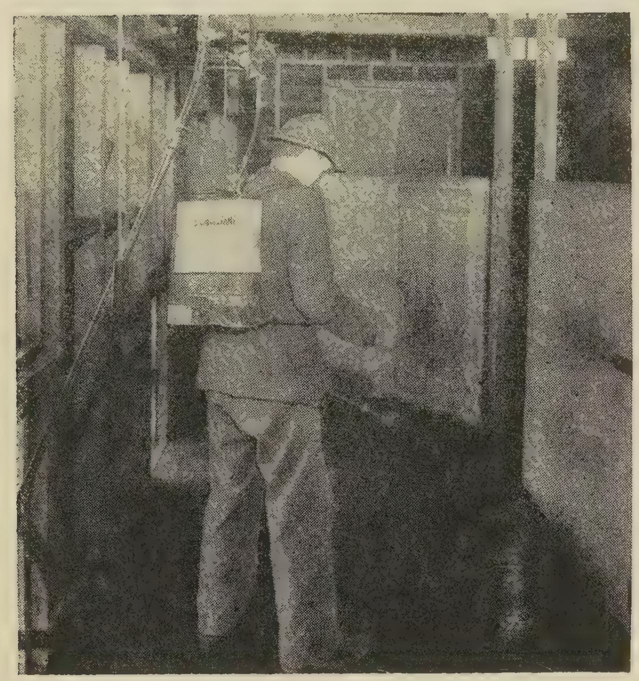


Despite this there are still conditions in the extensive areas of sand country where the sand, because of its height and exposure to gale force winds, is seldom stable enough for lupins to establish; or they would be destroyed by salt winds. Some other plants to do the initial work of stabilisation and to hold the sand under grazing when once it is stabilised must therefore be sought. A wide variety of legumes, grasses, and other plants for this purpose is being investigated in the hope that something less expensive, quicker growing, and more useful than marram grass and tree lupin may be found for use under such conditions.

Spinifex is likely to remain the best species for fixing and building up foredunes along the coast with the aid of temporary windbreaks of brush. Meantime the use of the ordinary bitter blue lupin as already indicated is recommended for stabilising moving raw sand on farms as a stage in the establishment of pasture or trees, provided that the land to windward is sufficiently stable to prevent heavy sand blows on to areas being stabilised.

◆

Care of Livestock during November



HEADING PHOTOGRAPH: Shearing preparations should include cleaning out of the woolshed. Campbell photograph.

Contributed by the Animal Research Division

SHEARING PREPARATIONS

PREPARATIONS for shearing should be made now. Attend to sheepyards and scrub out the woolshed. This will reduce trouble from such diseases as blood poisoning, tetanus, and caseous lymphadenitis ("lympho") after shearing. Check over all machinery to see that all parts are in good working order. Dag all dirty sheep and shear hoggets, wethers, dry ewes, and rams. When culling sheep before shearing pay particular attention to teeth, udder, and dropped belly. On fat lamb farms ewes are best shorn after one or two drafts of lambs are away.

CONTROL OF FAT LAMB PASTURE

Pastures on which ewes and lambs are grazing should never be allowed to become rank. If pastures are getting too long, they can best be controlled by cattle. Yearling beef cattle soon become quiet and they can then be run with ewes and lambs even in small paddocks.

DRY EWES

If ewes have not already been removed from the flock, they should be separated immediately. It is a good plan to shear them, and during shearing they should be inspected carefully for udder abnormalities. All ewes whose udders were empty at lambing and ewes with diseased udders, damaged teats, very large teats, very small teats, or badly placed teats should be culled. Dry ewes with defective mouths and old ewes which did not have a lamb this year should also be culled.

Dry ewes which are retained should not be allowed to get too fat during summer. If kept in hard store condition, they are more likely to hold when mated next autumn.

HYDATID CONTROL

The safe disposal of sheep offal for the control of hydatid infection is especially important during shearing time. At this time of the year there are extra dogs which require extra feeding, and the aged sheep used for this are most likely to harbour cysts. During this busy period extra vigilance is necessary to see that **offal is dealt with safely.**

EWE MANAGEMENT

Where lambs are weaned early this can be done at shearing time in late November. If lambs were not vaccinated against scabby mouth at docking, this can be done at shearing and weaning.

If special paddocks have not been set aside for early-weaned lambs and if feed is in short supply, a worthwhile result may be achieved by removing the ewes and leaving the lambs in the paddocks. When feed is scarce this removal of ewe competition for available feed more than offsets the loss of the small supplement of milk.

On hill country early-weaned ewes can be mob-grazed to assist in the control of bracken.

DIP RAMS EARLY

Rams should be dipped before they begin to flush, preferably before Christmas; flushed rams sometimes scald after dipping.

CARE OF PIGS

Dry sows should have access to good pasture and in addition should receive from 2 to 4 gallons of milk per day, depending on their condition. They should be kept thriving, but not allowed to become too fat. Keep only as many of the spring litters for baconers as can be fed adequately; the remainder should be sold as porkers.

VACCINATION AGAINST CONTAGIOUS ABORTION

Vaccination has reduced the New Zealand average rate of abortion in dairy cows from about 5 per cent to 1 per cent. There are, however, still too many dairy farmers who do not vaccinate their calves. Past freedom from abortion is no excuse for not vaccinating, as infection may be introduced into a herd at any time.

Though vaccination does not begin until January or February, applications should be made now, as veterinarians and inspectors of stock have to plan their vaccination itineraries. Late applications make this planning difficult. Calves should not be vaccinated until they are over 4 months. Poor immunity results if they are vaccinated before this.

Beef cows are just as susceptible to contagious abortion as dairy cows. By vaccinating heifers before mating many farmers have been able to increase the calving percentage of their beef cows very considerably.

GRAZING MANAGEMENT OF DAIRY PASTURES

During the season of maximum grass growth the problem is to control pastures at their most leafy, nutritious stage. This is best achieved by conserving all growth surplus to requirements as silage and hay. Later in the season it is important to maintain sufficient pasture cover to ensure growth during the dry summer period. As grass growth declines, gradually increase the periods in which paddocks are spelled between grazings and feed out as much silage as the cows will clean up.

Pasture and Crop Production

Seasonal Notes by the Extension Division

THOUGH the incidence of virus disease in turnip and swede crops in Canterbury in 1957-58 was very much lower than in the two preceding seasons, there is no reason to believe that if climatic conditions in any locality are suitable, the disease will not become serious. It is therefore wise to give some consideration to alternative crops in those areas where virus disease may depreciate the value of the turnip or swede crops.

CROPS TO REPLACE SWEDES AND TURNIPS

ON the lighter and drier soils where white-fleshed turnips are normally grown as a winter supplement the following crops should be considered as replacements for the turnip crop. Cereal green feeds can be sown late and are particularly valuable if earlier turnip sowings have failed. Italian and short-rotation ryegrasses provide better feed than the cereal green feeds, but they need to be sown earlier and under better seedbed conditions. Complete reliance on either or both of these types of feed will necessitate the enforcement of a strict system of rationing to stock. Lupin is the only crop which can be used to replace white-fleshed turnips without modification of the farm programme. If lupins only are relied on, successive sowings should be made. Mixtures of turnips and grass or turnips and lupins will generally provide a satisfactory insurance against possible turnip failure.

In the moister and cooler regions where swedes are used extensively as a winter feed crop, risks of crop failure can be reduced by sowing only varieties such as Calder, Sensation, or Wilhelmsburger which show resistance to virus disease. Chou moellier can be used as a satisfactory replacement crop, either alone or in a mixture with swedes. On small holdings where fertility conditions are high mangels and fodder beet, when cultivated intensively, are high-yielding replacement crops.

—M. L. CAMERON

* * *

SPRAY IRRIGATION IN NORTH ISLAND

IF the maximum response of pastures to spray irrigation is to be obtained, the beginning of irrigation should not be delayed too long; otherwise growth will practically cease and it will take some time to stimulate it again, even after water is applied.

It is the experience in most districts that irrigation is seldom warranted before November. On the other hand only in exceptional circumstances can it be delayed until after Christmas. From October onward the position must be watched. About 7 or 8 days with no appreciable rain and none forecast will mean that irrigation should begin.

When the initial irrigation is delayed through harvesting or other urgent farm operations additional water should be applied the first time round. This should be sufficient to wet the soil thoroughly to a depth of a foot or more.

—H. G. HOPEWELL

TIME OF CLOSING RYEGRASS SEED STAND

LATE September to early October is generally a suitable time to close a field for ryegrass seed, but where conditions favour rapid growth grazing may be carried on until November. Areas where the soil has been pugged and consolidated through winter stocking benefit from one or two strokes of the harrows. In addition to breaking the hard crust of the soil, harrowing helps to spread stock droppings evenly over the field.

At time of closing the application of 1 to 2 cwt. of sulphate of ammonia or ammonium nitrate-lime fertiliser will increase seed yields considerably, especially in crops that are backward and yellowish.

HARVESTING RYEGRASS

Ryegrass is ready to cut when the seed is well developed and has lost all trace of greenness. This stage is best indicated if a few seeds come away readily when a hat is swept lightly through the crop. The most satisfactory method for cutting the crop is with the reaper and binder, especially for Italian ryegrass and short-rotation ryegrass, which shed their seed readily. When a crop is cut with the mower or is windrowed, the width of cut should supply just as much material as can be handled easily by the header. Too much bulk results in faulty threshing. To avoid heating in the bags the seed should be thoroughly mature before threshing begins.

BLIND SEED DISEASE IN RYEGRASS

To avoid waste of time and to save money all ryegrass crops should have a pre-harvest examination for blind seed disease.

—R. G. JOLLY

* * *

GREEN FEED MAIZE IN CANTERBURY

GREEN feed maize is an excellent supplementary fodder either for feeding in situ or to cut and cart out to cattle during the dry summer months of January and February. Milk production is well maintained on the green, leafy stalks, and crops not required for summer feeding can be used for silage. In the dairying districts of Canterbury the growing of maize for green feed is gaining increasing popularity among dairy farmers, especially for town milk supply. Maize should be sown after all risk of frost damage has passed. From November to early December is recommended as a suitable sowing time in Canterbury. The crop is best suited to a deep sandy loam containing ample organic matter. Early deep ploughing with a winter fallow is necessary for producing maximum yields. Crops should be drilled in 7 in. rows or broadcast and disced in at a sowing rate of 1½ to 2 bushels per acre (though lower rates may be satisfactory).

Weeds, particularly fat-hen, can be troublesome during the early stages of crop growth. These can be readily controlled by spraying when the fat-hen is young with MCPA at ¾ lb. acid equivalent or 2,4-DB or MCPB at 1 lb. acid equivalent per acre. The most suitable varieties in order of merit are the American hybrids W643 and Pfister 360 and the open pollinated types Marigold and Hickory King. When hybrid maize is being sown for green feed it is more economical to use seed once removed from the parent material in preference to certified lines.

—D. J. G. DAVIES

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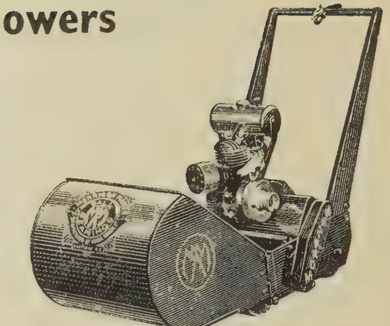

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Infra-red Space-heater Brooder for Rearing Chickens

METAL-CANOPY electric brooders with top heat and infra-red brooders are in common use for rearing chickens. A brooder which is a combination of these two types is described in this article by B. Parkin, Poultry Instructor, Department of Agriculture, Papakura. This combination results in an unusual type of brooder which is suitable for large units of chicks and is at present being used successfully for rearing chickens for the table.

THIS brooder is designed to combine the advantages of the dull emitter infra-red brooders with the economy and heat-retaining properties of the electric canopy space heater type of brooder. It has been designed to accommodate comparatively large units of chickens—namely, units of 500 to 600 day-old chicks—during the period when heat is required. Though opinions may differ as to which size of unit is best suited for good brooding, this type is excellent for those who favour big units. In particular it has proved successful for rearing table chickens and, in fact, was designed by a producer of table poultry.

For economic reasons it is common practice to run table chickens in large units, and two of these brooders have proved satisfactory for brooding 1,000 chickens in one compartment.

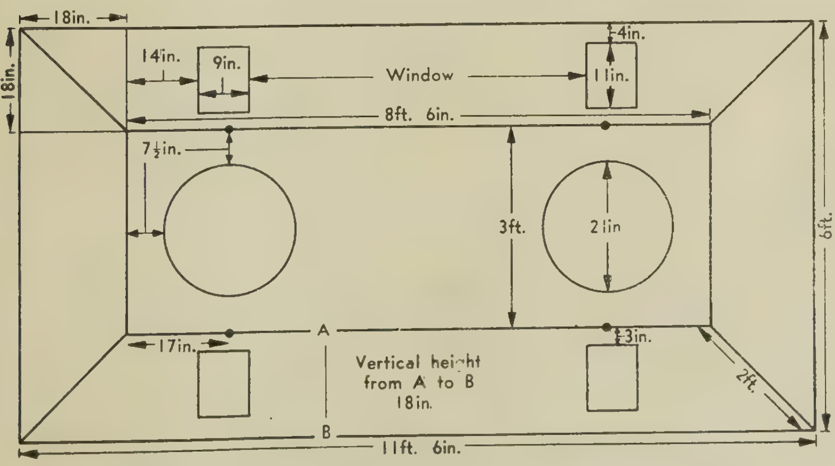
As this brooder is suspended by chains, it can be adjusted in height from the floor according to the age of the chickens. When chickens are a day old the sides of the canopy are about 3 in. to 4 in. above the litter.

Construction of Brooder

This brooder has two dull emitter infra-red heaters the reflectors of which are 22 in. in diameter. Each heater is rated at 500 watts. The brooder is made of a light wooden frame to the size and design shown in the plan. The framework is covered with a heat-insulating material backed with aluminium and the whole then covered again with hardboard, 3/16 in. for the top and ⅛ in. for the sides.

There are four windows in the sides of the canopy. Each consists of a sheet of glass which is slightly larger all round than the hole cut in the hardboard and insulating material. As the sides of the canopy have a 45 degree slope, there is no necessity to fix the piece of glass in each window. The glass rests against the side and is supported by a cleat or by a few screws at the bottom edge, and this allows the glass to be slid sideways to permit ventilation under the canopy when necessary.

Two holes cut in the top of the canopy are 1 in. less in diameter than the diameter of the metal reflectors of the infra-red heaters. Thus the heaters merely rest on top of the canopy and are not built in as fixtures. This also allows additional ventilation under the canopy if the reflectors are moved slightly to one side of their holes, leaving a small gap.



Plan of the brooder. The four dots represent chain suspension points.

Heat Control

A 5 watt pilot light is fitted under the brooder and kept alight while it is necessary to attract the very young chickens back under the canopy. A neon lamp is fitted on the outside of the top of the brooder and is connected with the heaters, thus indicating whether the latter are burning or not. The two heaters are controlled by a thermostat hanging under the canopy at a convenient point to be reached through a window and suitably placed in relation to the two heaters. Obviously the neon light is helpful when the thermostat control is being adjusted.

It must be emphasised that the manner in which the chicks sit and spread under the brooder is most important. The amount of heat supplied by adjustment of the thermostat should depend on the condition and position of the chickens, and should not be set by a thermometer.

Competent Electrician Required

It is necessary to have the electrical work on this brooder done by a competent electrician. The two heaters, and the neon lamp indicator, are wired in parallel via the thermostatic control switch direct to the supply plug. The pilot light under the canopy is wired via a switch direct to the supply plug head.

Size of Brooder

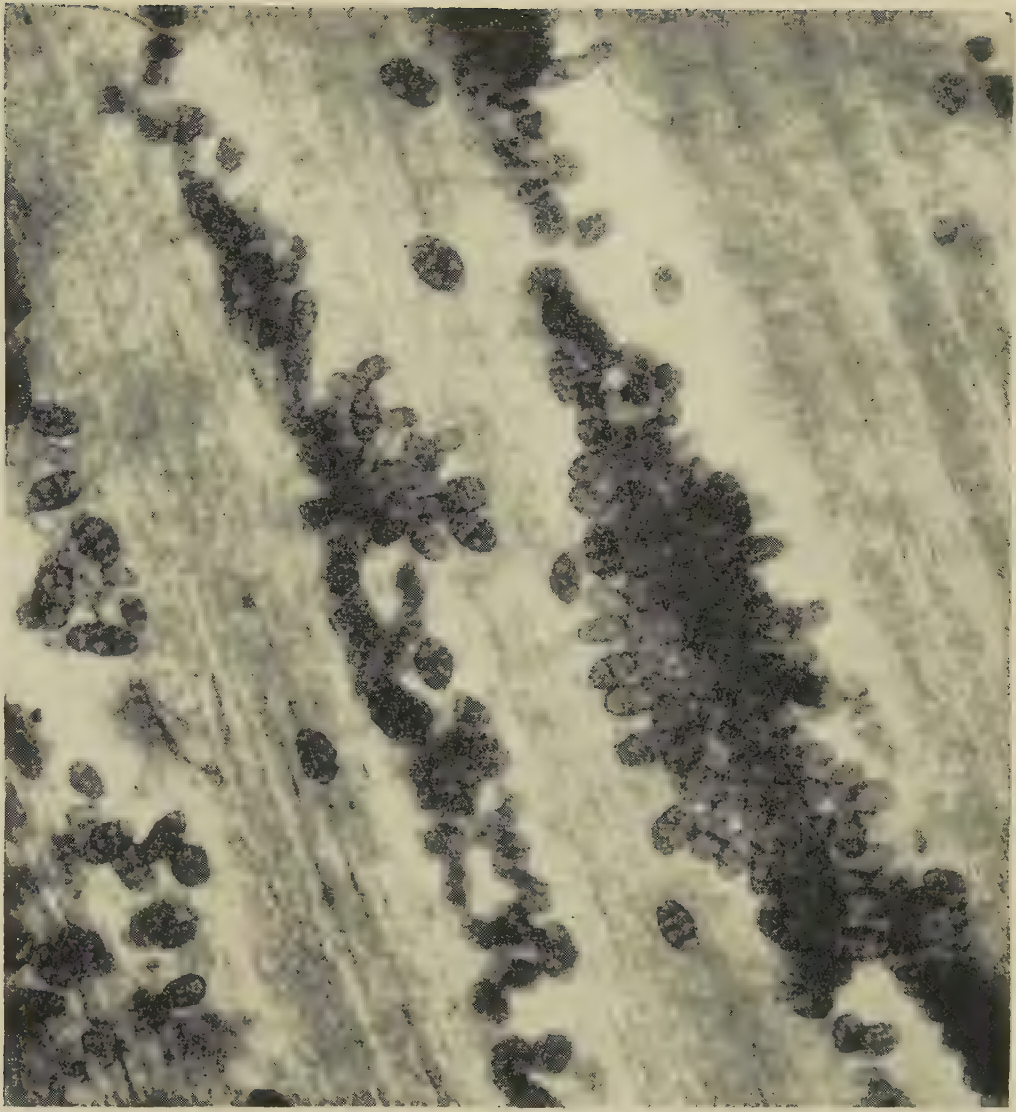
Where a smaller-capacity brooder of this type is required the brooder could be half the size of that described, that is, it could contain one heater. It would also be possible to use heaters of a different size or wattage by adjustments to the size of the canopy.

However, as already stated this particular type of brooder was specifically designed for use with large units of chickens and has proved economical in the use of electric current owing to the conservation of heat under the canopy and the automatic thermostatic control used. The main disadvantages of the normal type of infra-red dull emitter brooders are that there is no conservation of heat to reduce current usage, and if there is a power failure or cut, there is no reserve of heat whatever. The use of a canopy with these dull emitter heaters markedly overcomes these two disadvantages.

FUNGUS SHOWN CAPABLE OF PRODUCING CHARACTERISTIC LIVER DAMAGE

THE announcement early last month that the fungus *Stemphylium botryosum* had been incriminated as producing the toxin causing facial eczema signalled a notable advance in knowledge of one of the most baffling diseases of livestock. The discovery exemplifies the way many of the remaining problems of the day require cooperative attack by scientists of many different disciplines. Mycologists, pathologists, biochemists, and agriculturists have all made essential contributions to it. Events leading to this encouraging outcome of their collaboration are described in this article compiled from details supplied by officers of the Soil Bureau, Department of Scientific and Industrial Research, and the Department of Agriculture's Ruakura Animal Research Station.

THE FUNGUS *STEMPHYLIUM BOTRYOSUM*



Highly magnified spores showing the characteristic appearance that enables them to be easily recognised.

Spores on the surface of a highly magnified leaf of toxic grass.

THE history of facial eczema research over the last 50 years was told in the September issue of "The Journal of Agriculture". The article not only high-lighted the immense amount of ground which had been covered by a large number of scientists in defining the problem and developing techniques with which it could be attacked intelligently, but also emphasised the basic importance of discovering the origin and nature of the facial eczema toxin.

THE present story begins in February 1957 when the Soil Bureau, Department of Scientific and Industrial Research, offered to the Department of Agriculture's Ruakura Animal Research Station the assistance of a newly developed team of microbiologists with the general objective of following the seasonal changes in microbial populations on some of the areas prone to facial eczema on which the Ruakura facial eczema team was working. It was hoped that the work, in addition to providing basic knowledge of soil and pasture micro-organisms, might allow a more critical examination of any possible association between micro-organisms and facial eczema than had been practicable hitherto.

It had long been considered that a fungus or some other micro-organism might produce the liver damaging factor either in the soil or on or in the plant. Despite close investigation of this theory after the 1938 outbreak, no positive evidence of such an association could be demonstrated.

Though in the main the fungus theory was virtually abandoned in favour of a plant origin for the toxin, there were pointers that kept it alive: The occurrence of facial eczema in the field coincided with weather conditions which often produced a prolific growth of mushrooms and other fungi; the biochemical work on the isolation of the toxin from toxic grass at Ruakura had reached a stage which suggested that the poison had some points of similarity to poisons derived from fungi; and in particular the chemical of the "beaker test" was allied structurally to products isolated from fungi.

The Microbiological Team

Realisation that soil microbiology was a neglected aspect of New Zealand agricultural research led to attempts being made by the Soil Bureau since 1945 to set up a microbiological team. As a result of inadequate facilities and the inability to recruit highly trained staff, progress was slow and not until 1955 could the team associated with the new discovery be assembled at Taita and a real attempt made to open up the field of soil microbiology in New Zealand.

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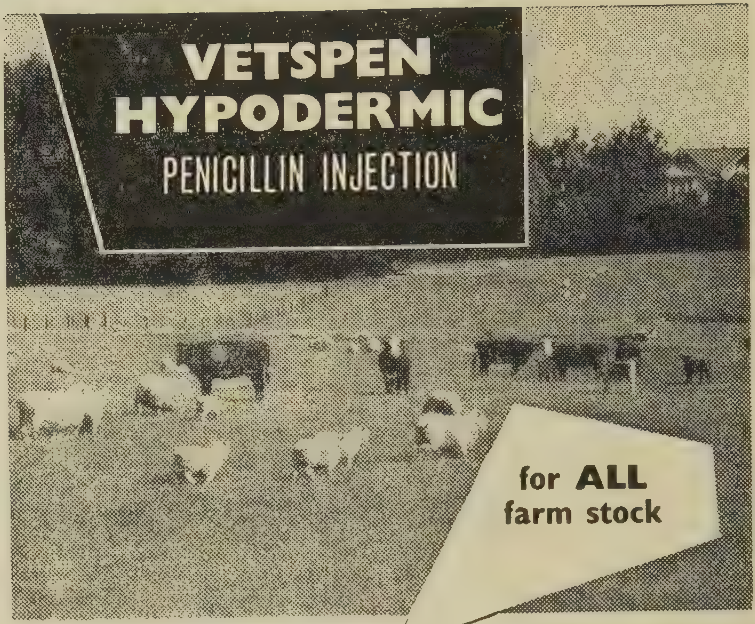

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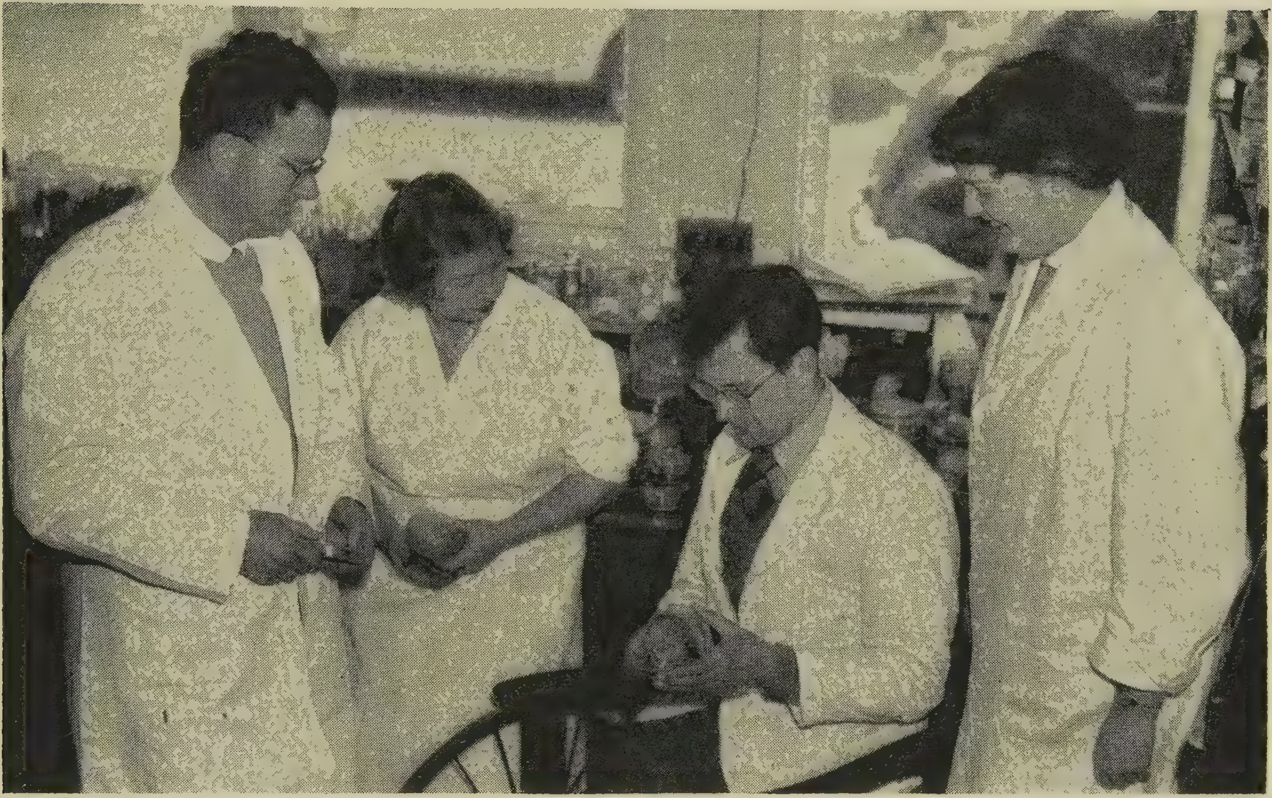


The Soil Bureau microbiological team associated with the discovery. From left—Dr R. H. Thornton, Dr Margaret di Menna, Dr J. Stout, and Miss Marjorie Bennett. Absent, Dr D. J. Ross.

The team consists of:

Dr R. H. Thornton, team leader, who works on fungi;

Dr Margaret di Menna, who works on yeasts;

Dr J. Stout and Miss Marjorie Bennett, who work on bacteria and protozoa;

Dr D. J. Ross, biochemist, who works on the nutrient requirements of the micro-organisms and the functions they perform.

Work at Ruakura

Work at Ruakura with the soil Bureau microbiologists began when Dr Thornton and Dr Ross joined Mr J. C. Percival, who was in charge of field operations for the collection and testing of toxic grass. The Ruakura chemists Messrs N. T. Clare, E. P. White, and Dr N. A. Worker, the pathologist Mr D. C. Dodd, and the bacteriologist Mr W. E. Crawley were also associated with the investigations.

A plan of campaign was organised and the Claudelands polo ground was selected as the centre of operations. Work over the previous 5 years had shown this area to be the most reliable source of toxic material in the Waikato. During 1957 soil and pasture samples were collected systematically from this area for examination at Taita by the microbiologists.

Seeking a Starting Point

There was no clue to the identity of a likely causative organism nor was it known whether a micro-organism played any part in incidence of the disease. It was therefore necessary to examine both the topsoil and the pasture, since a micro-organism could affect the pasture either by producing a toxin which was taken up by the roots of the pasture plants or by contaminating their surfaces.

It was realised also that in such work the strain of any particular organism and the nutrients supplied to it in the culture medium play such an important part in the formation of byproducts, toxic or otherwise, that it was unlikely that the problem would be solved in any preliminary screening. All that was sought was a clue so that work might be concentrated in a particular direction.

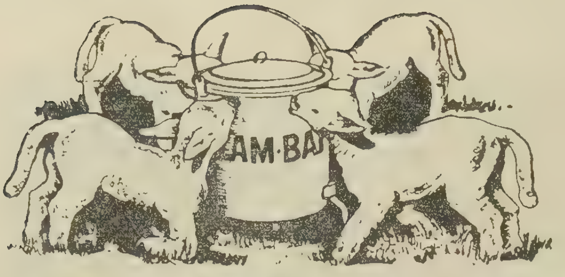
A great deal of detailed work was done. Some 4,500 organisms (80 species) were isolated from the soil and grown in culture. Some 1,500 organisms (40 species) were cultured from the pasture leaves. Approximately 1,100 soil organisms—160 fungi (15 species), 450 bacteria (20 species), and 500 yeasts (24 species)—were cultured from the Claudelands plot alone.

Most Likely Culprits

Five fungi, two yeasts, and two bacteria were selected as the most likely subjects for first tests. They were grown on various media and fed to guinea pigs with negative results. The same organisms, plus two additional yeasts, were "beaker tested" with negative results. This was most discouraging, but at least certain organisms had been eliminated as suspects.

First Fungus Link

In early March 1958 when grass was being collected because conditions were such that facial eczema was expected, Mr Percival noticed some white fungal threads at the base of pasture plants on the area being cut.



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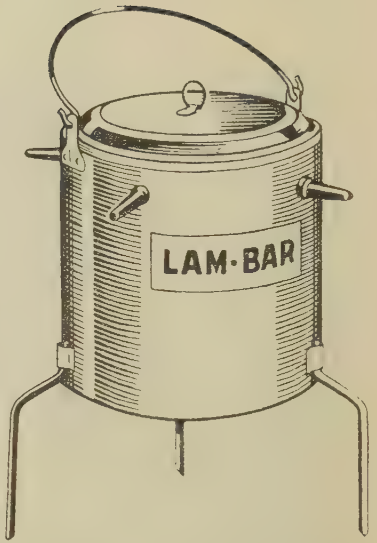

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Some of the Ruakura and Soil Bureau officers associated with the work on *Stemphylium botryosum*: At back, from left—Messrs J. C. Percival, E. P. White, Dr N. A. Worker, Dr C. P. McMeekan, Mr N. H. Taylor, and Dr R. H. Thornton. In front, from left—Messrs W. E. Crawley, D. C. Dodd, and N. T. Clare.

Several turf samples containing these were forwarded to Taita.

About two weeks later, on one of Mr Percival's frequent visits to Claudelands, the caretaker of the polo ground, Mr G. D. Smith, casually remarked to him that a fine cloud of dust-like material had been hovering above his mowers when he had gang-mowed the area a few days earlier. Mr Percival examined the mowers and from them collected a quantity of spore-like material, part of which was subjected to the "beaker test" and part forwarded to Taita for examination.

A strongly positive "beaker test" reaction was obtained. This was a notable discovery because it represented the first definite link between facial eczema and a fungus. Earlier work by Ruakura chemists had shown that the beaker test was a fairly reliable method of detecting toxicity of pasture samples. Mr White quickly showed that the chemical substance responsible for the beaker test was contained in Mr Percival's crude spore material.

In the meantime the Taita workers had found that the turfs from Claudelands contained five species of fungi. Half the total quantity of fungi were *Stemphylium botryosum* and the spores submitted were also *Stemphylium.*

Stemphylium was grown on sterilised non-toxic grass, on dead ryegrass roots, and on a nutrient solution, and, with six other fungi, was sent to Ruakura for the beaker test, but, much to everyone's chagrin, all turned out to be negative.

The fungus grown in culture solution was fed to guinea pigs at Wallaceville, and the results again proved negative.

Despite this setback the workers did not give up. Because large numbers of spores were present on toxic grass at Claudelands and Palmerston North (as many as a million were found on a handful of toxic grass), Dr Thornton separated several strains of the fungus from Claudelands turf to select a high-sporing strain. Then various media were tried by Dr Ross to get maximum growth and spore formation.

A high-sporing strain (Strain C) grew well on certain media, and spores of this strain from cultures on potato-carrot and another medium at last gave a positive beaker test.

The next stage was to recover the beaker test chemical substance from spores similarly grown in pure culture. This was successfully achieved by Mr White from material grown at Ruakura.

Crucial Feeding Tests

The next phase of the work was obvious. It became imperative to test the fungus for the presence of the facial eczema toxin. The growing of sufficient supplies to feed to guinea pigs was organised.

Fungal material grown at both Ruakura and Taita produced liver lesions diagnosed by Mr Dodd as identical with the damage resulting from the feeding of dried toxic grass and extracts made therefrom.

The damage caused by the fungus was obtained both with the complete material involving a mixture of spores, fungus, and media fed direct, and by dried ether extracts of this material fed on non-toxic feed.

Although this evidence was highly suggestive, it was considered desirable

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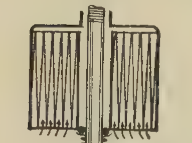

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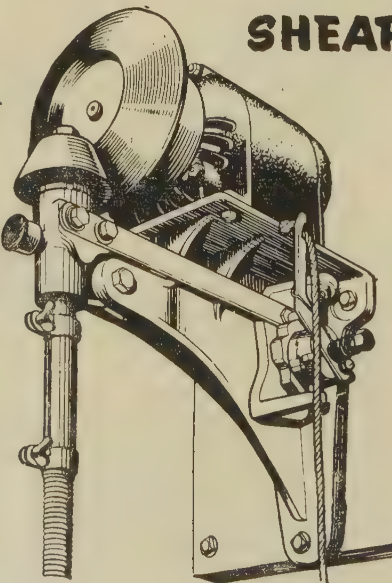

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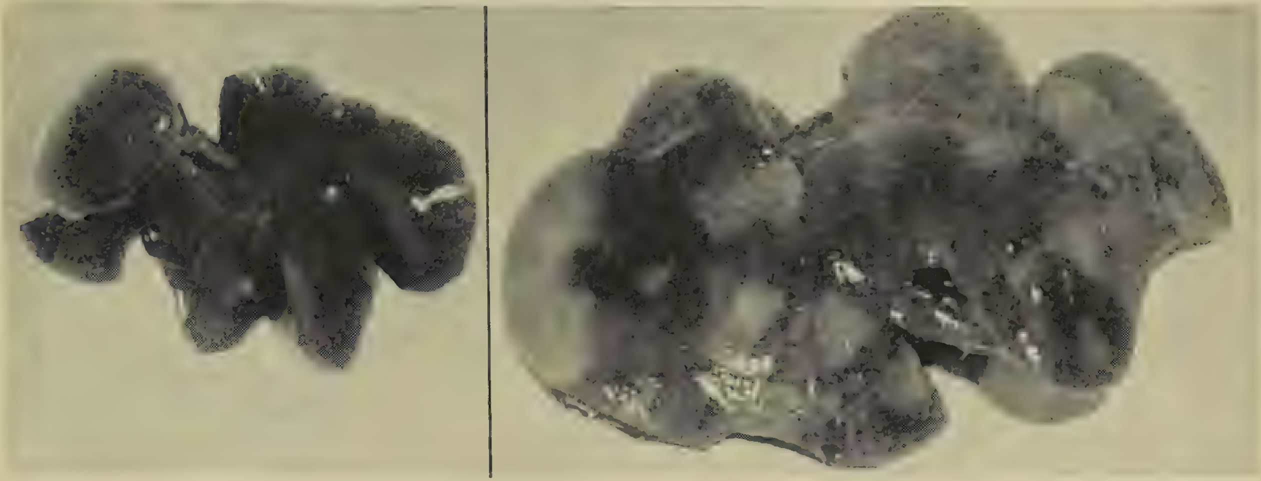
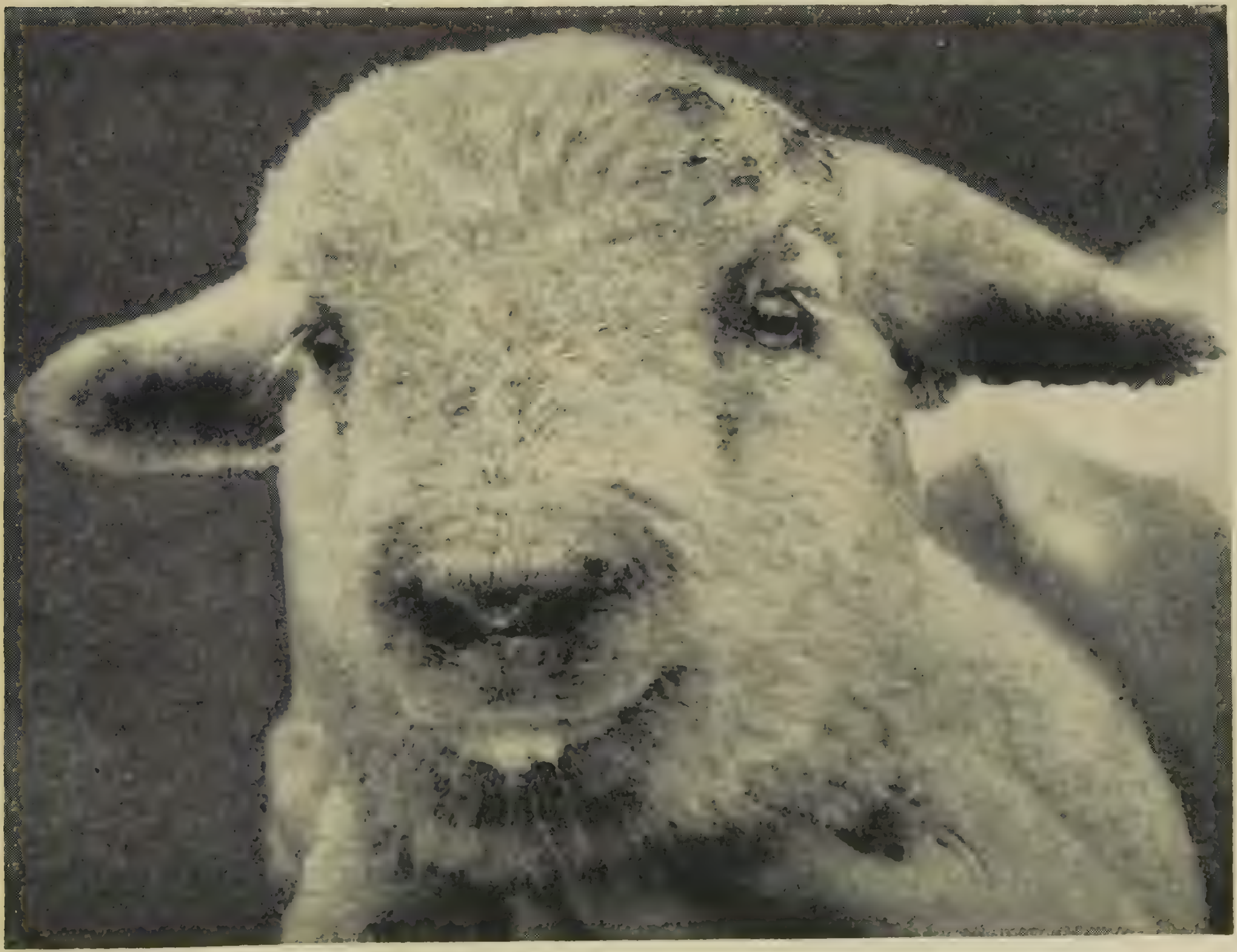


Normal guinea pig liver (left) compared with affected liver from guinea pig fed fungal material. The increased size and mottled appearance are characteristic of damage caused by facial eczema.



Clinical symptoms of facial eczema produced in this lamb fed fungal material included both jaundice and facial lesions. Photograph was taken at an early stage in the development of symptoms, but characteristic swelling and drooping of ears and swelling of eyelids are evident.

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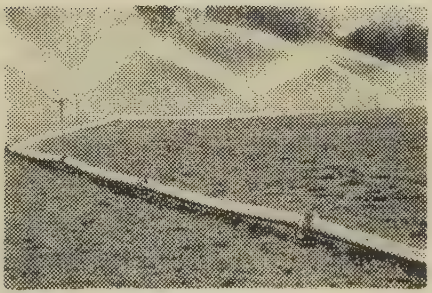

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to attempt to produce similar damage in the lamb, since the disease is primarily a disease of ruminants.

Tests were conducted with three lambs. In two of these typical liver damage occurred. In the third, which was fed longer, clinical symptoms of facial eczema were produced, including both jaundice and facial lesions.

Great Aid to Chemists

The importance of this discovery will be appreciated. If it can be shown that the fungus is always associated with facial eczema in the field, then the work of the chemist in identifying and characterising the toxin will be greatly assisted.

It is quite apparent from what has been done so far that the fungal material contains a much greater concentration of liver-damaging factor than the most toxic samples of pasture collected so far. In addition, the fact that the fungal material is not mixed with plant tissue should aid in extraction of the toxin in pure form. The chemists will not have to eliminate from toxic extracts the mass of complex plant constituents.

This point is of particular importance, since it is already known from biochemical studies that only a few parts per million of the facial eczema toxin are present in dried pasture. In the past this fact has made chemical progress extremely slow and difficult.

It is obvious that investigations into alternative methods of controlling *Stemphylium* in the field, or, in particular, of preventing it from producing large numbers of spores may provide methods of control of the disease which will be more acceptable to the farming community than those developed so far.

Farmers Must Wait

At the same time it cannot be stressed too strongly that farmers cannot expect spectacular progress to be made on control of the disease in the near future.

The microbiological group at Taita will have to study the life history of the organism in detail and under varying environmental conditions with the objective of finding the chinks in its armour. Such studies will involve a great deal of painstaking basic work and may involve a long time and many workers.

Ruakura and Manutuke staff will have to study in much greater detail the precise relationships between the fungus and the disease in livestock and to test out promising lines of attack under field conditions.

The need for collaborative work in both fields is obvious.

Other centres of research are also likely to be able to contribute in a worthwhile manner. Undoubtedly the Plant Diseases Division at Mount Albert, Auckland, and the Grasslands and Plant Chemistry Divisions of the Department of Scientific and Industrial Research at Palmerston North will be able to assist.

These studies will be of special scientific interest, since distribution of the fungus in question is world wide. Reasons for such a common fungus suddenly and sporadically becoming toxic to ruminant animals could be of profound importance not only in the study of facial eczema, but to the whole complex of soil, plant, and animal microbiological associations.

Until, therefore, the full story is known, farmers have no alternative but to continue to depend on known methods of control.

In particular they are strongly advised against the indiscriminate use of commercial fungicides on their pastures, since nearly all such materials are directly poisonous to livestock.

They can rest assured that as soon as a safe method of control has been devised, they will be informed of it.

This brief summary does scant justice to the score or more workers in the laboratories and field who have helped in the project described. In particular, field and laboratory technicians have given their time and energy unsparingly to enable the work to be carried to its present satisfactory stage.

It is certain the work will be vigorously advanced in the search for further results which it is hoped will lead to finding better control methods for practical application on farms.

Control of the Potato Tuber Moth

THE potato tuber moth caterpillar continues to cause severe damage in crops, especially on the lighter soils where no precautionary measures for control are carried out.

The moth is small, brown, and grey, about ½ in. long, and normally flies at night, though when disturbed it can be easily seen during the day. It makes its appearance as early as November-December and lays its eggs on the undersides of the leaves and on stems. The main damage comes from eggs laid on exposed tubers through insufficient moulding or as a result of soil cracking. The larvae hatch out and burrow down into the tubers, making them unfit for table or seed.

Depth of Planting

The first step in control is to plant the seed tubers at least 6 in. deep. Rows should be not less than 30 in. apart—the wider the rows the better—as more soil is available for complete coverage of the growing tubers and only the minimum amount of damage is done to the foliage when ground spraying and moulding operations are carried out.

In a dry season the first spraying should be undertaken in November or before the moth makes it appearance. To keep a crop clean, regular sprayings every 14 days are necessary and thorough moulding must also be maintained.

In the Hawke's Bay district lindane or dieldrin sprayed in the emulsion form at ½ lb. of pure active ingredient per acre has proved the most effective. Two pints of 20 per cent emulsion per acre will give this rate of application. For ground application the recommended rate is 2 pints in 100 gallons of water and for aerial application 2 pints in 20 gallons of water.

During digging the sacks should be sewn immediately and at no time should the haulms be placed on top of the sacks.

Precautions in Storage

Damage is also likely to occur during storage. If potatoes are stored in sacks, the outsides of the sacks should be sprayed regularly and this also applies to potatoes which are pitted and covered with straw. Whichever spraying material is used, it should not be applied directly on to the tubers if they are intended for eating.

—*F. H. COLLIN,*
Fields Instructor,
Department of Agriculture,
Hastings

◆

Main Wool Sales

The dates and venues of main wool sales until the end of January are:

22 and 24 October: Dunedin.
30 October and 1 November: Christchurch.
10 November: Auckland.
14 November: Wanganui.
19 and 21 November: Napier.
26 November: Wellington.
5 December: Christchurch.
10 December: Invercargill.
15 December: Dunedin.
19 December: Timaru.
9 January: Wanganui.
14 and 16 January: Auckland.
21 and 23 January: Napier.
28 and 30 January: Wellington.

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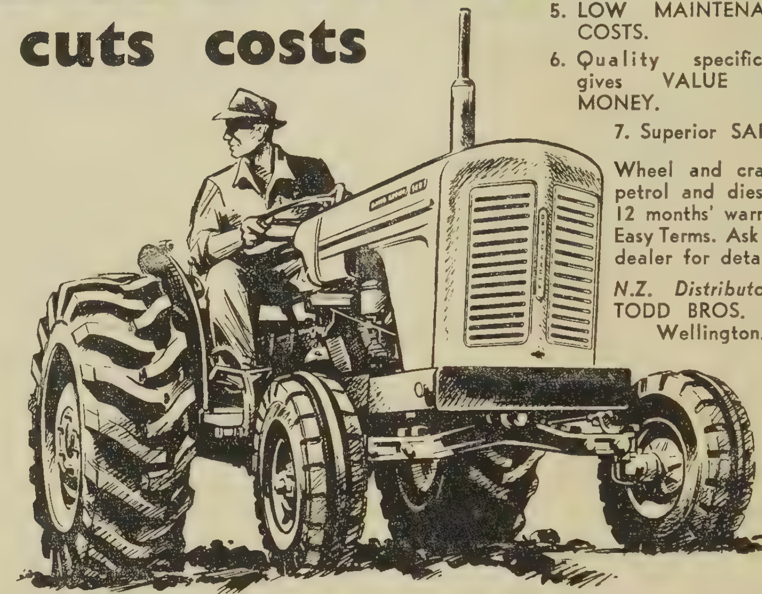

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Sheep Meat Sales to North America: Prospects for Expansion

PROSPECTS of developing trade in New Zealand sheep meats in North America, where many people have not traditionally been eaters of lamb and mutton, were reviewed optimistically by Mr A. B. Baker, a member of the New Zealand Meat Producers Board in an address to the Timaru Centennial Farm School on "The Future Market for Meat". The section of Mr Baker's address which dealt with selling mutton and lamb in the under-supplied North American market follows.

A GREAT part of the world does not know how good mutton and lamb can be; New Zealand is the only country that has intensively developed the top-quality type for the meat trade. Frozen New Zealand lamb does not carry the strong taste that some people in other countries object to in the sheep meats produced there.

In the past we have had no real incentive to persuade markets other than Britain, and in a small way Canada, to take our lamb. We have over the years sold mutton to Russia, to Greece, and now Turkey and other countries in smaller quantity, but only recently has there been the pressing need to market lamb in quantity outside Britain.

North American Market

The logical alternative markets are in the United States and Canada. Sheep flocks there are comparatively small. There are 31 million sheep in the United States with its population of 170 million people, compared with our 40 million sheep and 2¼ million people. Canada has not much more than a million sheep, with 17 million people.

Consumption of lamb in the United States is at present just under 4 lb. a head per annum. It has declined from 7.2 lb. in 1945. Consumption of lamb and mutton in Canada is currently only 2.7 lb. a head, whereas in the 1930's it was 5.2 lb. These figures may be compared with Britain's 22 lb. a head.

The decline in consumption per head in North America has been primarily due to the inability of the sheep producing industries in those countries to keep pace with the population growth. Between now and 1970—only 12 years hence—the population of the United States is expected to reach 200 million. Population growth in the next two or three decades is expected to add 30 to 35 per cent to total United States demand for farm products, and growth in real income is expected to add a little more again to that demand. In the United States the consumption of lamb, if there are no significant imports, will rise only as far as production rises, and lamb production in turn may well depend on the profitability of wool production.

I hope I have indicated what large possibilities there are in the North American market. Even to maintain the present low and declining rate of availability of lamb, imports will be needed. Already lamb is losing ground because of inability of producers to supply the market the year round. That is a source of concern to Californian lamb raisers today. I believe we can organise supply of lambs from New Zealand in such a way as to fit into the off-season in California and other parts of the United States. In that way it would be possible to co-operate with the local producer in maintaining supply and thereby holding the customer's interest and enabling lamb buying to become habitual.

Regional Preference

As the figures stand at present it is an attractive conclusion that there could well be a very large increase in the total disposal of lamb in the United States market if larger supplies were available. It has to be accepted that meat eating habits are largely inherited like one's religion. Lamb and mutton are regarded as "regional" items of food. That is, there are nationalistic and religious motivations behind the habit of eating or not eating mutton and lamb. Families of British, Italian, and Jewish ancestry are the principal consumers of lamb in the United States. This accounts for the concentration of lamb consumption in New York, San Francisco, Los Angeles, and Boston. A survey conducted by the American Meat Institute shows that the average housewife in New York spends about 10 times as much on sheep meats as the average housewife in Omaha.

Even accepting the prejudices, and if attention is given only to those who eat mutton and lamb already, the prospect of achieving increased consumption, if supply is available, does not look difficult. The Agricultural Marketing Service of the United States Department of Agriculture in a report made in January of this year has examined in detail the availability of lamb in retail shops and the methods of merchandising it. The report states that many potential retail outlets for lamb do not even handle the product.

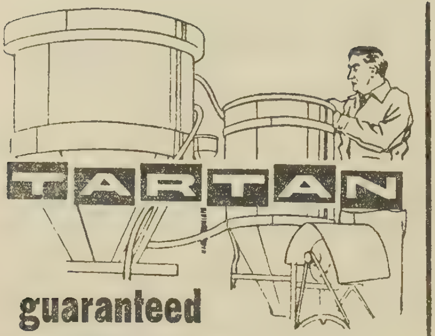
Lamb is available in only 39 per cent of all the retail stores handling fresh red meats in the United States. In the north-east 73 per cent of the stores carry lamb, in the west 54 per cent, in the north central region 33 per cent, and in the south only 17 per cent sell lamb. It is significant that the period of lowest availability of lamb is June, July, and August, when we can readily supply the South Island type of lamb in the 8 and 4 grades, which appear to be most favoured by United States importers now interested in our trade.

The same report emphasises that many potential outlets for lamb are not even being used. Only 90,500 stores out of 232,800 selling fresh meat sell lamb. "If lamb is not available in stores," says the report, "it is immediately excluded from the meats the buyer may choose." The report goes further; it notes that lamb displays in shops continue to be an important factor in the homemaker's decision to buy lamb. A report at the Meat Board's office shows that in a consumer survey in a large Ohio city about half the housewives interviewed said that though they usually made up their minds about meat purchases before they left home, they were influenced to buy lamb because of the displays in the shops.

Our experience over 30 years and more in sales promotion in the United Kingdom persuades us that it should be technically possible to market a significant portion of our production in both the United States and Canada. It is first necessary to have complete understanding with producers in those countries and to dovetail our marketing with theirs. There are, of course, very real political difficulties in the United States which we shall have to overcome. The Canadian market offers in some ways even better opportunities with less complex obstacles.

Medals for Progressive Farmers

THE Royal Agricultural Society of New Zealand has offered two silver medals each year for award to members and ex-members of Young Farmers' Clubs not over 40 years, one in each island, who are nominated by a Y.F.C. and who have the most outstanding records as progressive farmers. Adoption of practices that have raised production, land development, and breeding of superior livestock are factors that will be considered. Nominations for the first awards close on 1 October 1959.



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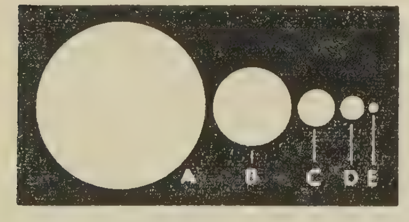

The diagram above shows sizes of common materials compared with Tartan Fenodren.

A: Particle of typical flour. *B:* Particle of face powder. *C, D & E:* Typical size range of Tartan Fenodren particles.

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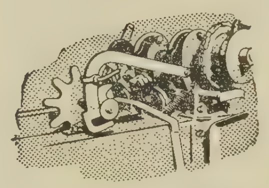

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The Home Garden in November

By A. G. KENNELLY,
Horticultural Instructor, Department of Agriculture, Dunedin

THE risk of frost damage is past by November, except in a few southern districts early in the month, and the ground has warmed enough for good growth of half-hardy plants such as dwarf and runner beans, pumpkins, sweet corn, and tomatoes. Successional or main-crop sowings can be made of root crops, and potatoes can still be planted. Successional, preferably small, sowings can be made of crops such as lettuce, mustard and cress, radishes, and spring onions for salad use.

LATE autumn, winter, and early spring crops are just as important as summer ones, and in most districts seed of plants such as savoy cabbage, winter cauliflower or broccoli, fine-leaved kale, leeks, and parsnips should be sown, or preferably seedling plants should be established early in November ready for setting out in December or January or, at the latest in all except the mildest districts, in early February.

Successional sowings of peas can be made where soil conditions are not likely to become excessively dry. Where conditions are favourable celery plants, particularly the self-blanching kind, can be set out.

Crop rotation should be practised and crops should be kept weed free. Thinning should be done as soon as seedlings are large enough to be handled conveniently, so that the remaining plants are not disturbed too much.

Plants, particularly those grown for their vegetative or leafy qualities, that tend to slow in growth owing to the exhaustion of some plant nutrients in the soil may be stimulated by a top-dressing of nitrogenous fertiliser. Sulphate of ammonia or nitrate of soda is suitable, though where conditions tend to be dry, regular applications of liquid manure may be more effective. This can be made by dissolving sulphate of ammonia or nitrate of soda in water, at about 2 oz. to the gallon, or by suspending a partly filled sugar bag or sack of animal manure in a large container of water and using the liquid.

Beans

Climbing beans are best staked or allowed to climb a support such as a double row of arched 8 ft. stakes or they can be supported by wires (in a fence system) with strings or pea sticks running vertically from the wires. A third method is to use groups of 3 or 4 stakes of 8 ft. or longer placed firmly in the ground 18 to 24 in. apart and inclining toward each other

SOWING AND PLANTING

Half-hardy or Tender Crops to be Sown or Set out if Frost Danger Past

Dwarf or runner beans, sweet corn, cucumbers, marrows, pumpkins, squash, *melons, tomatoes, *egg plants, *capsicum, *kumara, yams.

* Need specially warm, favourable conditions.

Successional or Other Sowings as Required

Summer cabbages, cauliflowers, carrots, beetroot, parsnips, peas, lettuces, onions for salads, radishes, turnips, salsify, scorzonera.

Plants and Tubers to Set out as Required

Summer or autumn cabbages, cauliflowers, celery, celeriac, cucumbers, lettuces, Brussels sprouts (an early planting if necessary), potatoes (late planting if desired).

Beetroot and carrots can also be transplanted in favourable circumstances.

*Sowings to Produce Plants for Winter Use

Brussels sprouts, winter or savoy cabbages, winter cauliflowers or broccoli, kale or borecole, leeks.

* If not already sown (except in favourable far northern districts, where later sowing is satisfactory).

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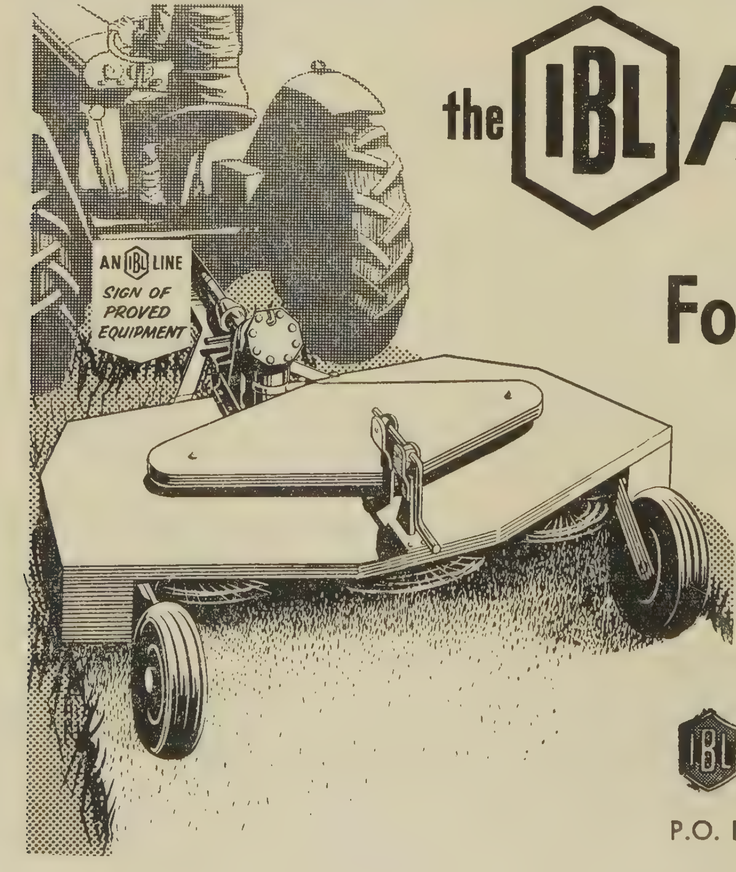

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so that they can be tied at a point near the top.

Red Mite Damage

Red mites (red spiders) often attack beans. The adult mites are very small and difficult to see with the unaided eye, particularly early in the season, when they are usually greenish, though they may be pale yellowish or cream with a darker patch on each side of the body. Later in autumn they usually turn red. They spin fine webs on the undersides of the leaves, which they rasp, denuding them of green matter, so that the leaves take on a silvered appearance.

An important aspect of the control of red mite is to destroy weeds on which the mites feed and multiply and are carried over from one crop to another. Red mites can be controlled by spraying with summer oil at 1/3 pint to 4 gallons of water or chlorobenzide wettable powder preparations according to the manufacturers' recommendations.

Celery

Where conditions are warm enough self-blanching celery can be set out during November in beds or trenches in soil that has been heavily manured. Beds are usually made 4 to 6 rows wide with the plants set out 10 to 12 in. apart each way. In trenches a double row 9 to 12 in. apart with the same spacing between the plants is satisfactory. The trench can be any depth up to 12 in.

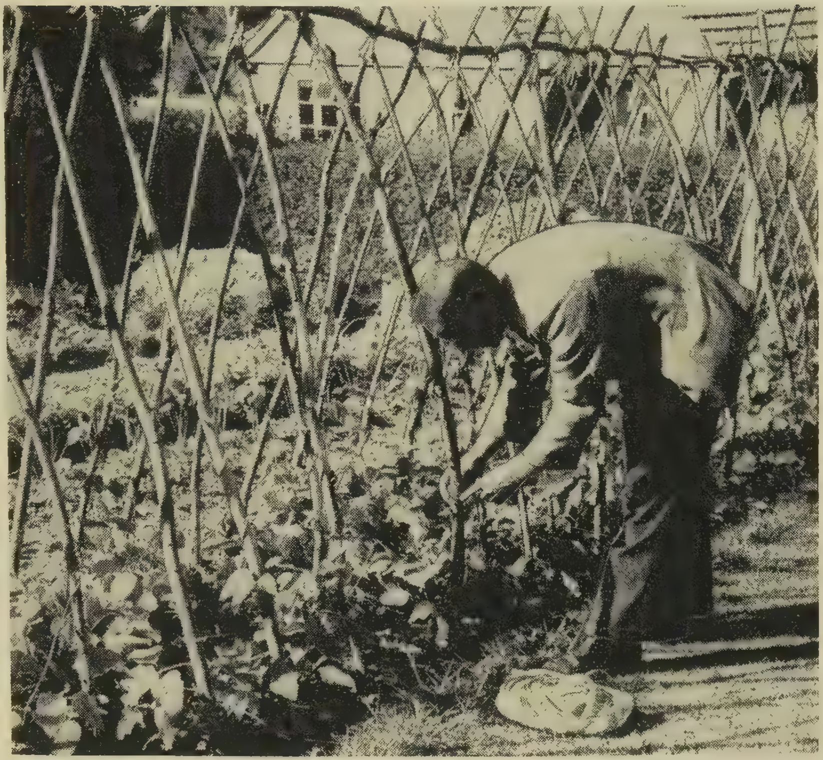
Blanching of double rows can be done by drawing the soil high against the ribs, care being taken not to allow any to get into the centres of the plants, or by wrapping individual plants with stout paper. Beds containing multiple rows are best blanched by placing lengths of 12 in. x 1 in. timber along the outside edges of the bed. Blanching should not be begun until the plants are about 3 weeks from maturity, as otherwise their development will be arrested.

Poultry or farmyard manure is a very suitable manure, but where this is unobtainable or in short supply a mixture of 4 parts of blood and bone, 2 parts of superphosphate, and 1 part of potash by weight can be broadcast over the area at ¼ lb. to a square yard and worked into the soil after digging.

Green Types

Green Pascal types of celery are becoming increasingly popular. Utah 10B is available in New Zealand, but there are other strains widely grown in the U.S.A. The Green Pascal types are characterised by their thick, meaty stems and crisp texture. They are relatively stringless. Some strains require prompt cutting on reaching maturity, but Utah 16-11 is reported to hold its quality well.

Celery should be kept weed free, and where conditions are humid enough for leaf spot to be troublesome it should be sprayed with zineb, captan, thiram, or copper oxychloride at 7- to 10-day intervals. Where aphids are present nicotine sulphate at 1 fl. oz. to 5 gallons of water should be applied. Celery should not be planted in a part of the garden recently occupied by a carrot crop which has been affected by the carrot rust fly, as the pest is also liable to attack celery.



A good method of supporting climbing beans.

Kumaras

Kumaras or sweet potatoes are usually propagated by rooted shoots or slips, which can be purchased from seedsmen, usually from about mid October onward in areas suited to the culture of the plant.

The soil for kumaras should be of a type that warms readily, and light or sandy loams are usually preferred. Organic manure applied to a previous crop gives most satisfactory results and in most soils it should be supplemented with a dressing of bone meal or superphosphate, as trials indicate that kumaras need a good deal of phosphate, though the need for potash seems to depend more on soil type. Very little nitrogen is usually required and an excess promotes top growth at the expense of tubers. As roots are very sensitive to injury, fertiliser should be well worked along the rows a week or two before planting.

Planting can be done on the flat, but in districts in New Zealand where there is no danger of soil drying out plants are usually set out on broad, low ridges, which warm quickly and facilitate digging. Care should be taken that the rooted shoots do not dry out between lifting and planting. If necessary, they should be puddled in thick, muddy water.

In the home garden slips should be set out 16 in. apart on the flattened tops of low ridges 24 in. apart. Plants, which should be set about the same depth as they grew in the propagating bed, are considered to make better tuber development if the rooted portion of each plant is bent up like the bottom end of a J. Plants should be watered when they are set out, if conditions are dry. Apart from weed control and the repair of broken ridges, cultivation is unnecessary, though vines are usually lifted occasionally to prevent their rooting, as such rooting appears to favour leaf rather than tuber development.

New Zealand Spinach

New Zealand spinach, which is a half-hardy, trailing annual with large, succulent leaves, can still be sown. It is not a true spinach, but is valuable for use in hot, dry, sunny situations and is often preferred because it lacks

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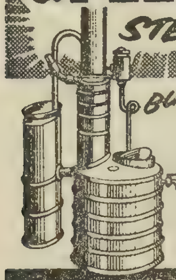

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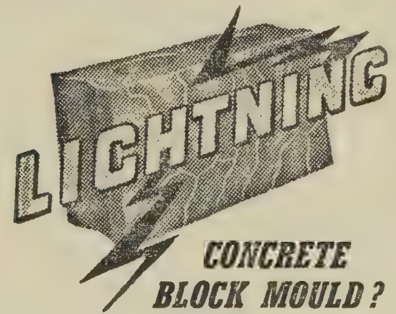

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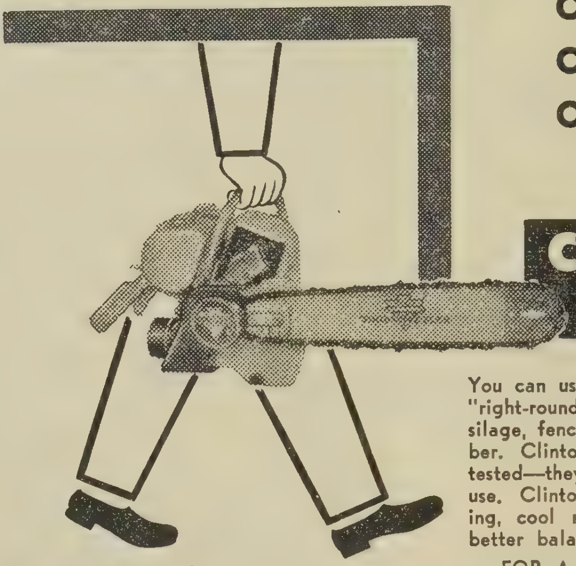

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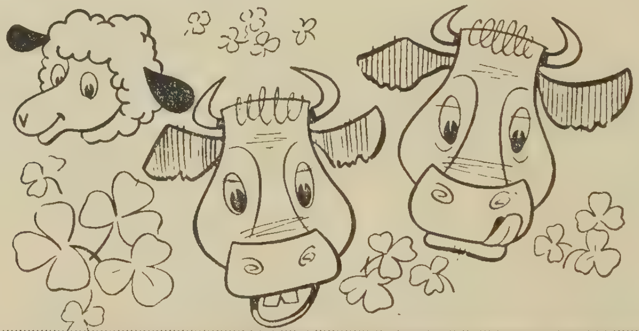

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the peculiar bitterness of true spinach. Growth of New Zealand spinach is rapid at this time of year in most soils, but it responds best to a light, fertile soil in a sunny position with adequate moisture.

New Zealand spinach is harvested by pinching off about 3 in. of the growing tips, which forces new shoots to develop, so that when established the plant has a multitude of tips for gathering. It grows quite large and plants should be given a spacing of at least 2 ft. each way.

Seed, which is usually rather slow to germinate, should be sown 1 to 1½ in. deep not more than a week before frost danger is past. Two or three seeds should be sown together at each spacing and the weakest seedlings removed after establishment.

Parsnips

Though October is the preferred month in southern districts for sowing parsnips, November or December or even later sowings are usually satisfactory in districts which have a long season of growth. Parsnips are high yielding and when well established in moderately rich, well drained soil need little attention. Probably their greatest value lies in their use as a winter vegetable, as in well drained soil they remain in good condition for a very long period.

Like most other succulent, taprooted vegetables, parsnips should be kept growing steadily if they are to be of good quality and yield well. A deep, friable, well drained, deeply cultivated soil well supplied with humus is preferable.

Parsnips do best in soil to which organic manure has been applied to the preceding crop, though satisfactory results can be obtained if manure is applied in moderation and is well rotted and thoroughly incorporated in the soil before sowing. Where organic manure is not available compost or a green crop should be dug in and supplemented with a fertiliser rich in nitrogen, phosphorus, and potash. Local experience must determine the actual ratio, but a complete fertiliser high in phosphorus and relatively low in nitrogen is likely to be most suitable.

Growing Large Parsnips

For the production of long, straight roots the ground must be dug to a depth of 2 ft. or more unless it is very loose and open. This entails too much work for the average home gardener and the method sometimes adopted is to make holes with a crowbar 9 to 12 in. apart and fill them with fine, suitably prepared soil (potting soil is suitable). After the soil is firmed 4 or 5 seeds are sown in each hole, as germination of parsnip seed is usually poor. Only the strongest seedling from each hole is left after seed has germinated.

Taller varieties of peas will now be needing support such as that shown. Vines and pods are liable to be damaged if they lie on the soil.

Tomatoes

Tomato plants are usually set out from about the middle to the end of October according to district and frost incidence, except in parts of Canterbury and some southern districts where there is danger of frost until about the second week in November. Soil preparation should preferably have been carried out some time before planting out. Soil should be deeply dug and should contain plenty of humus and should not have been used recently for tomatoes or potatoes, because of risk of carry-over of disease.

A complete fertiliser can be dug in or it can be scattered in a furrow taken out with a hoe on the line on which the plants are to be set out and the furrow closed by hoeing the soil back over the fertiliser. Staked plants are usually set out 12 to 15 in. apart in the rows with the rows about 3 to 4 ft. apart. Dwarf varieties may be set out 2 ft. x 3 ft. apart, but where space permits plants usually are better spaced 3 ft. x 3 ft. or 3 ft. x 4 ft.

Where late blight and stem borer or other caterpillars are troublesome it is advisable to apply a fungicide (such as copper oxychloride or one of the newer fungicides) and DDT regularly The first spray should be applied within about 10 days of planting and spraying repeated every 2 to 4 weeks according to the weather and local severity of late blight and pests. To avoid health hazards DDT should not be applied to fruit within 3 weeks of harvesting. Fungicide sprays are usually not necessary in the drier districts.

Plants which show any marked deviation from normal growth should be destroyed. Distortion of young leaves or mosaic mottling may indicate infection with virus, different strains of which vary in their effect on tomato plants. Those which develop narrow, distorted, fern-like leaves or have a stunted appearance usually give little if any crop. They should be removed and burnt, but great care should be taken not to touch healthy plants before washing the hands after handling infected plants, as most virus diseases are readily transmitted by the hands.

Varieties

Good dwarf varieties include Stoner's Dwarf Gem, Adelaide Dwarf, The Amateur, Marglobe, and Early Chatham. Popular tall varieties are

Here is evidence that even small gardens can contribute a large part of the fresh vegetables needed in all households.

Meteorological Records for August

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	52.9	+ 1.9	68.7	35.8	4.10	20	— 2.73	1.21	27	166
Auckland	160	53.4	+ 1.2	64.8	37.1	3.83	17	— 0.59	0.66	21	149
Tauranga	10	50.2	+ 0.5	63.8	30.6	3.72	19	— 1.03	0.60	24	163
Ruakura	131	49.0	+ 1.2	65.2	24.3	5.63	21	+ 1.54	0.81	20	124
Whakarewarewa ..	1004	47.3	+ 1.8	62.6	27.3	6.67	15	+ 1.57	1.03	21	133
Gisborne	14	49.8	+ 0.6	66.3	30.8	1.84	17	— 2.02	0.48	24	149
New Plymouth ..	160	50.4	+ 0.8	64.1	31.3	4.96	23	— 0.79	0.57	3	132
Karioi	2125	42.6	+ 0.6	60.0	23.0	5.02	15	+ 0.81	1.52	2	
Napier	5	49.8	+ 0.7	68.9	29.5	1.50	12	— 1.43	0.68	22	150
Wanganui	72	49.0	— 0.1	65.0	31.8	3.65	16	+ 0.70	0.70	3	135
Palmerston North ..	110	48.0	+ 0.3	65.8	28.1	5.84	19	+ 2.09	1.12	22	97
Waingawa	340	47.0	+ 1.1	62.3	26.0	2.16	14	— 2.02	0.54	22	145
Wellington	415	48.4	+ 0.8	61.0	33.8	2.10	15	— 2.55	0.60	9	131
Nelson airfield ..	5	46.0	+ 1.2	64.0	25.9	2.57	16	— 0.57	0.55	28	177
Blenheim	12	47.5	+ 1.2	67.0	26.9	1.29	9	— 1.04	0.53	9	200
Hokitika	15	45.8	+ 1.1	60.6	30.0	11.02	16	+ 1.98	2.89	9	130
Hanmer	1270	43.4	+ 2.0	67.0	20.0	0.87	5	— 2.71	0.39	15	169
Christchurch ..	22	46.2	+ 1.9	69.4	25.2	1.07	4	— 0.98	0.56	4	159
Ashburton	323	45.3	+ 1.6	69.0	24.4	0.70	3	— 1.62	0.63	15	157
Timaru . ..	56	44.3	+ 0.5	68.8	27.4	1.01	7	— 0.45	0.81	15	146
Alexandra	520	41.6	+ 0.2	63.5	22.0	0.12	4	— 0.51	0.07	21	127
Taieri	80	43.6	— 0.1	67.0	26.0	0.34	8	— 1.40	0.13	15	114
Invercargill airfield ..	0	43.4	+ 0.4	62.3	28.1	3.33	18	+ 0.39	0.72	2	98
Chatham Islands ..	140	46.6	+ 0.4	56.5	35.2	4.34	22	+ 1.17	0.64	22	

Kondine, Best of All, Carter's Sunrise, Potentate, Moneymaker, and Stoner's Prolific, though many others are listed in seedsmen's catalogues.

Yams

The plant called the yam grown in New Zealand gardens belongs to the same family as the shamrock, the foliage of which is somewhat similar. It is grown for the tubers, which are long and ovoid and are marked with numerous regular hollows. They have smooth skin which may be yellow, white, or red. The end which joins the stem is usually slightly narrowed.

The plant, which has a spreading habit, grows well in warm situations in well drained, rich soils. Light soils are preferable. The yam is a perennial, but as it is frost tender, it is usually grown after the manner of potatoes. It is propagated by sets like the potato, but can be grown from cuttings, which are easily rooted.

The sets should be planted 3 in. deep and 18 in. apart in rows 2 ft. apart as early as possible, but the time of planting should be arranged so that there will be no danger of frost damage to the foliage. In districts where the plant grows particularly well spacing should be more liberal.

As the stems lengthen they should be covered to within 6 to 8 in. of the tops with light soil or compost, as this assists the development of tubers. The tubers, which are produced in great abundance, are rarely thicker than a hen's egg. They do not swell much until fairly late in the season, and in most districts it is not customary to gather them until frost has cut down the foliage. The tubers of some strains have a somewhat acid taste when first dug, but quickly lose this acidity on exposure to the sun.

◆

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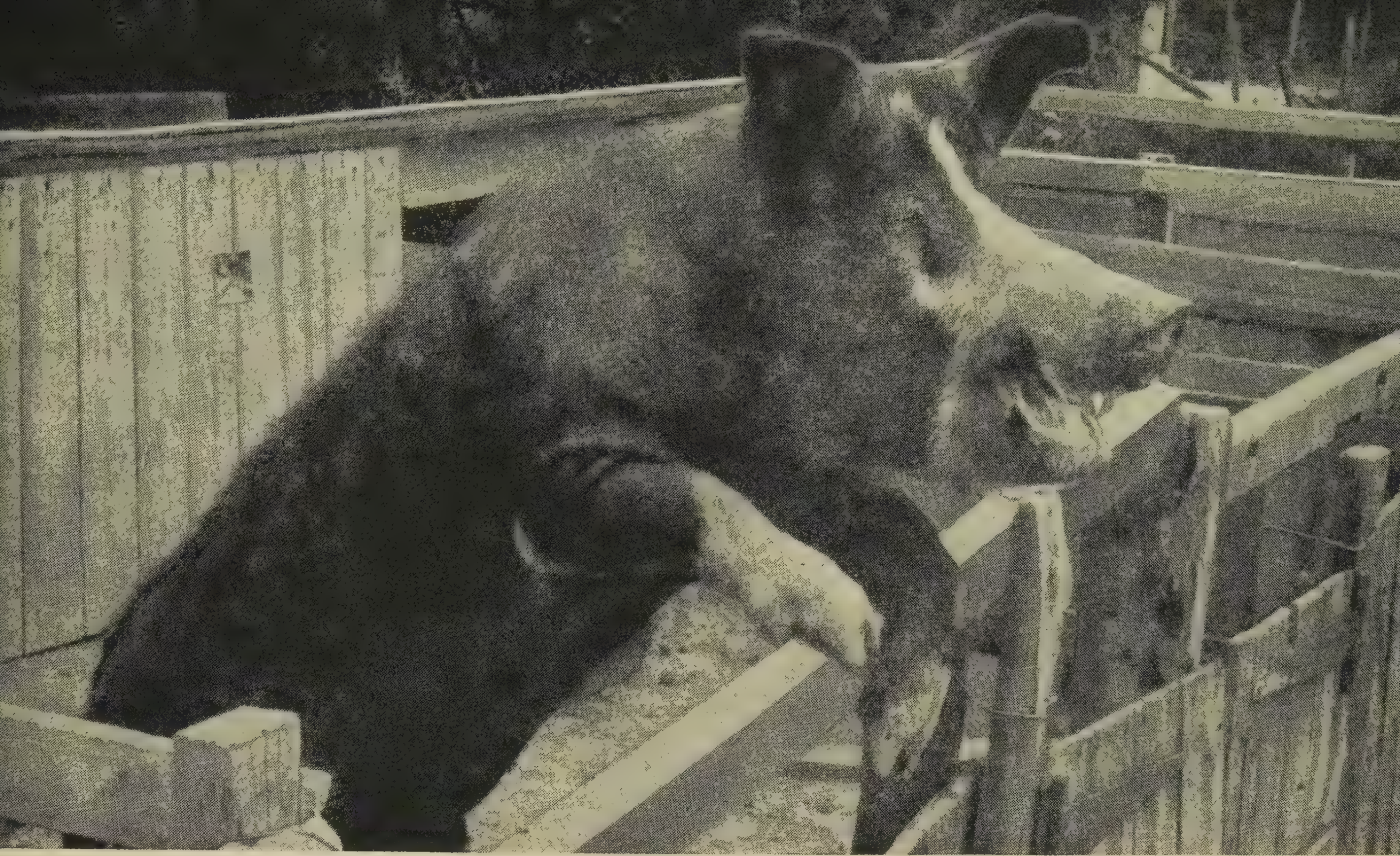

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Good Profits from Pigs on Wairarapa Farm

NET returns from pigs on one Wairarapa mixed farm last season exceeded 1s. per pound of butterfat produced. The farmer attributes his success to the provision of warm housing and to sound feeding methods. As many farmers will be counting on greater support from their pigs in future, the story behind this achievement is given by E. D. Edwards, Research Officer, Department of Agriculture, Wellington.

IN May 1953 Mr A. B. McCallum bought a 370-acre sheep farm at Kopuaranga, just north of Masterton. He had a small dairy herd (about a dozen cows) and needed some accommodation for his pigs. As finance was short, 6 temporary units were constructed from car casing, with concrete feeding yards. This housing was far from satisfactory, but finances did not permit the building of a new piggery until January 1957.

There are now two round farrowing houses and two dual-purpose houses, built with coke-breeze concrete blocks which have been sealed with a cement wash. The yard and race walls are of concrete blocks. Heat lamps are fitted for extra warmth. These units were built for about £75 each on the advice of the Wellington District Pig Council Supervisor and are proving a sound investment.

Several types of round houses with movable roofs are in use on farms, but unless these roofs are properly secured there is risk of damage by wind. One of Mr McCallum's round houses was damaged in a 95 m.p.h. gale last November. The comparatively heavy roof is in two sections hinged at a central gutter, which is attached to the walls with bolts. Each section was also secured at a point approximately in the middle of the outside. The wind lifted the front section and blew it over backward, taking with it about a third of the wall of the house and the holding-down bolts. At the time a sow and her recently farrowed litter were in the house, but all survived.

In the light of this experience each section of the roof is now secured in two places round the outside under tension, thus preventing any movement.

Breeding Stock

Mr McCallum originally bought a purebred Berkshire sow from Mr Mark Wiles, who was then pig farming at Featherston and is now the local District Pig Council Supervisor. This sow was mated to a neighbour's Tamworth boar.

The present herd of 5 sows are the progeny of this mating and 3 gilts on hand are from the old sows by a Berkshire boar also bought from Mr Wiles.

Sow Management

A policy of weaning litters at 3 to 4 weeks was followed in the past season and has worked very well. No difficulty was experienced in getting the sows in pig again after holding them back from the boar for a period in summer.

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▲ Mr McCallum feeding weaners in the new piggery.

Feeding methods are based on Ruakura recommendations. For the first month after mating sows are fed on skim milk and pig pellets or both, according to the supply of milk, to put some condition on them and are then allowed to roam over the dairy farm of 80 acres. One month before farrowing they are brought in and given a daily ration of 2 lb. of pellets plus some milk, and a week before they are due to farrow the ration is stepped up to include 4 lb. of meal or pellets.

Farrowing

The sows farrow in the round houses and the temporarily reduced ration is increased to 4 lb. of meal or 4 gallons of milk plus ¾ lb. of meal for each piglet. This ration is continued after weaning at 3 to 4 weeks until mating.

It has been found desirable to shift sows and litters to the dual-purpose house about 5 days after farrowing to encourage the litters to creep feed as early as possible. When in the round house the litter has to venture outside in all weathers to reach the self-feeder, but in the dual-purpose house the feed can be in a corner near the heat lamp, and cold weather does not discourage creep feeding.

Litter Management

The aim is to promote rapid growth in litters by sound feeding and provision of adequate warmth. The cost of purchased food and of the heat lamps as used during the past season has been comparatively high despite the profits made and Mr McCallum plans to reduce it this season.

No. 1 sow milk-replacement pellets have been fed ad lib. in the self-feeder from the time pigs are 7 to 10 days old until they were 5 to 6 weeks old and changed gradually through No. 2 pellets to a pig meal, which has been fed in the trough to reduce waste. The plan is to switch gradually at about 5 weeks from No. 1 pellets to meal.

A 250-watt heat lamp was in continuous use for the first 4 weeks and then mainly at night for 2 weeks. However, this year a 150-watt spot lamp has been used instead of the 250-watt lamp. It cost less, is more economical to run, and is just as effective. The cost of using electricity in this fashion was estimated to be 4s. 8d. per pig reared. Toward the end of the season a new method which is expected to reduce power costs by half was introduced. The use of heat lamps will cease when the litter is about 4 weeks old and small kennels made from bales of hay will be put in either the round house or the dual-purpose house.

When the farm was visited in July all the weaners were housed in this manner and were obviously thriving under the treatment. Their cleanliness and bloom must not only cause pride in ownership but is an important selling point when they are sold on the hoof. These pigs never get out to pasture after weaning.

The average number of pigs lost per litter from all causes is only 1.1, which is about 15 per cent of all pigs born. No losses could be attributed to overlying by the sow.

Previously, in the old piggery losses were double what they now are, due chiefly to the housing being too cold.

Another indication of the interest shown in the pigs on this farm is that all litters are weighed periodically. The average weight per pig at 3 weeks is 10 lb., at 8 weeks it is 40 lb., and at 12 weeks two litters averaged 80 lb. liveweight per pig. These are good performances under farm conditions. The important point about these regular weighings is that they help pinpoint problems, differences between strains, and so forth.

Cash Returns

The gross income from pigs has increased as follows since Mr McCallum took over the farm:

	£
1954	67
1955	139
1956	207
1957	184
1958	396

During the first 4 years pigs were sold mainly as porkers and baconers and expenses were confined largely to the purchase of a few bags of meal each year. During the last year, however, most of the pigs were sold as weaners or stores at local saleyards. Despite the seasonal and periodic fluctuations in values which normally occur at saleyards, very good prices were obtained as is apparent below:

43 weaners averaging 43 lb. liveweight were sold during spring and summer and netted £4 11s. per pig.

21 stores averaging 50 lb. liveweight were sold in July and August and netted £5 5s. 6d. per pig.

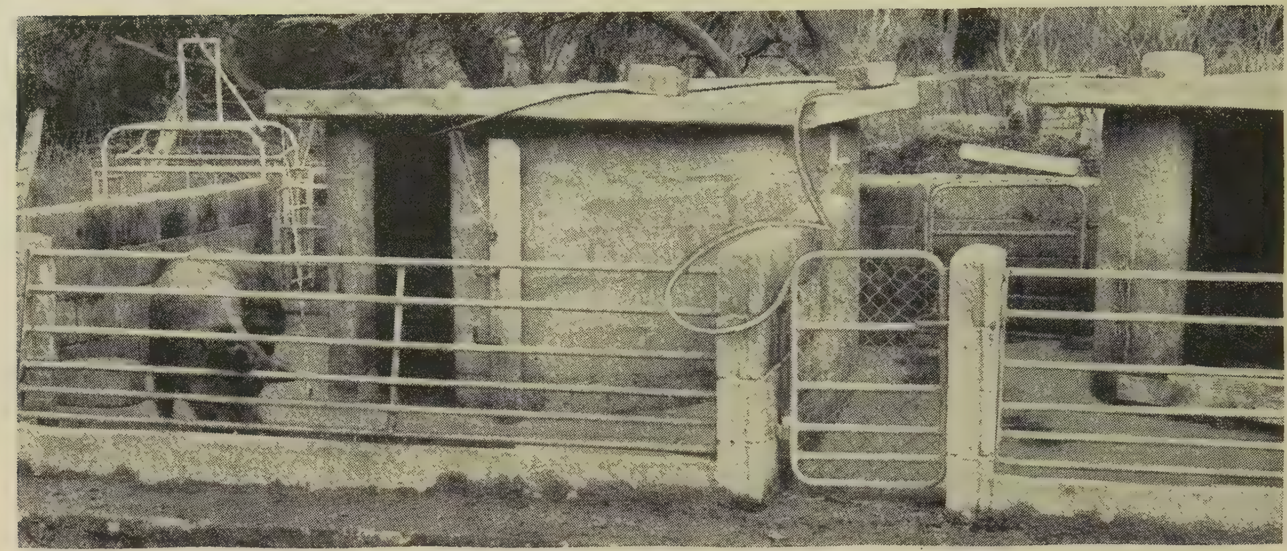
14 porkers averaging 85 lb. liveweight were sold in March and netted £5 5s. 5d. per pig.

However, these are only returns from sales. Mr McCallum listed his expenses as follows:

Bought feed			
6½ bags pig pellets	14	6	0
42 bags pig meal	90	6	0
5 bags No. 1 sow milk-replacement pellets	17	12	6
8½ bags No. 2 sow milk-replacement pellets	23	6	3
1,174 units of electric power @ 4d. per unit	19	11	4
Cartage	6	3	9
Total	171	5	10

The net farm return from pigs was £208 18s. 6d. In addition 3 pigs were kept for sow replacement and the total return would therefore be about £250.

In addition to the supply of skim milk from his own cows, Mr McCallum collected about 1,200 gallons from a



The round houses in which the sows farrow and at left back the weighing equipment. All litters at this piggery are weighed periodically.

nearby farmer during the season. This has not been costed, as it is obtained for cartage, and since it is picked up during the trip to school with his children it is virtually costless.

Based on the total supply of milk the farm profits from pigs amount to nearly £14 per cow or 1s. 5d. per pound of butterfat. Some 248 hours of work during the year were necessary to produce this return, or roughly 1 hour daily during winter and spring and ½ hour daily in summer and autumn.

Making More Money from Pigs

Many farmers this year will be seeking ways of supplementing their main source of income. Mr McCallum has shown both dairy farmers and sheep farmers how profitable pigs can be even on a small scale.

He has capitalised on the situation which has existed where farmers prefer to buy in pigs for fattening rather than breed their own. He has obtained a gross value for pigmeat of about 2s. 9d. per pound and farmers who have purchased his pigs would have to feed them for between 2 and 5 months and sell at almost half the price that they paid. A few deaths among bought pigs would leave little room for profit.

The total cost of producing weaners largely determines whether they are to be reared on the farm or purchased. Normally food, labour, and overhead charges in producing a weaner would vary between about £2 and £3 per pig. Mr McCallum's costs amount to roughly £3 13s. per pig, half of which is spent on food. His costs are, therefore, comparatively high, though he frequently gets top price for his pigs at the sale by bringing them forward in first-class condition.

The more people who rear their own requirements the less profitable will be the price received by the weaner producer, and specialisation in this line would decline; hence Mr McCallum's efforts to cut costs by using meals more economically and finding cheaper methods of supplying warmth for his pigs.

However, this account of his pig enterprise shows that the fundamentals of good sow management and litter production are the foundation of profitable pig production. If these were observed by more farmers, the ideal of farmers generally having sufficient home-bred pigs to cope with feed supplies would be more nearly achieved.

Photographs by Ayson.

Government-approved Turnip and Swede Seeds

STOCKS of each variety of Government-approved turnip and swede seed will this year be blended into a single blend before distribution throughout New Zealand. In this way seed of a particular variety will be of a uniform quality, irrespective of the district in which it is sold to the farmer. Government-approved seed is packeted in appropriately labelled 1 lb. and 2 lb. calico bags which are sewn with a lockstitching machine and have a Departmental over-stamp.

Most varieties of Government-approved turnip and swede seed being distributed this year have a germination of over 90 per cent. Seed of two varieties—Waites Eclipse and Champion Hybrid turnip—though below that standard, has a germination over 85 per cent. No lines of this year's Government-approved seed have a germination below this figure. If seed from an earlier distribution is still available from retailers, samples should be subjected to a fresh germination test before sale.

Attention is drawn to the relatively small size of Government-approved seed of the Wye swede variety. This small size seems to be a characteristic of the variety. It is suggested that to reduce crowding of the bulbs a lower seeding rate, about that used with turnip seed, be adopted for sowing seed of this variety.

◆

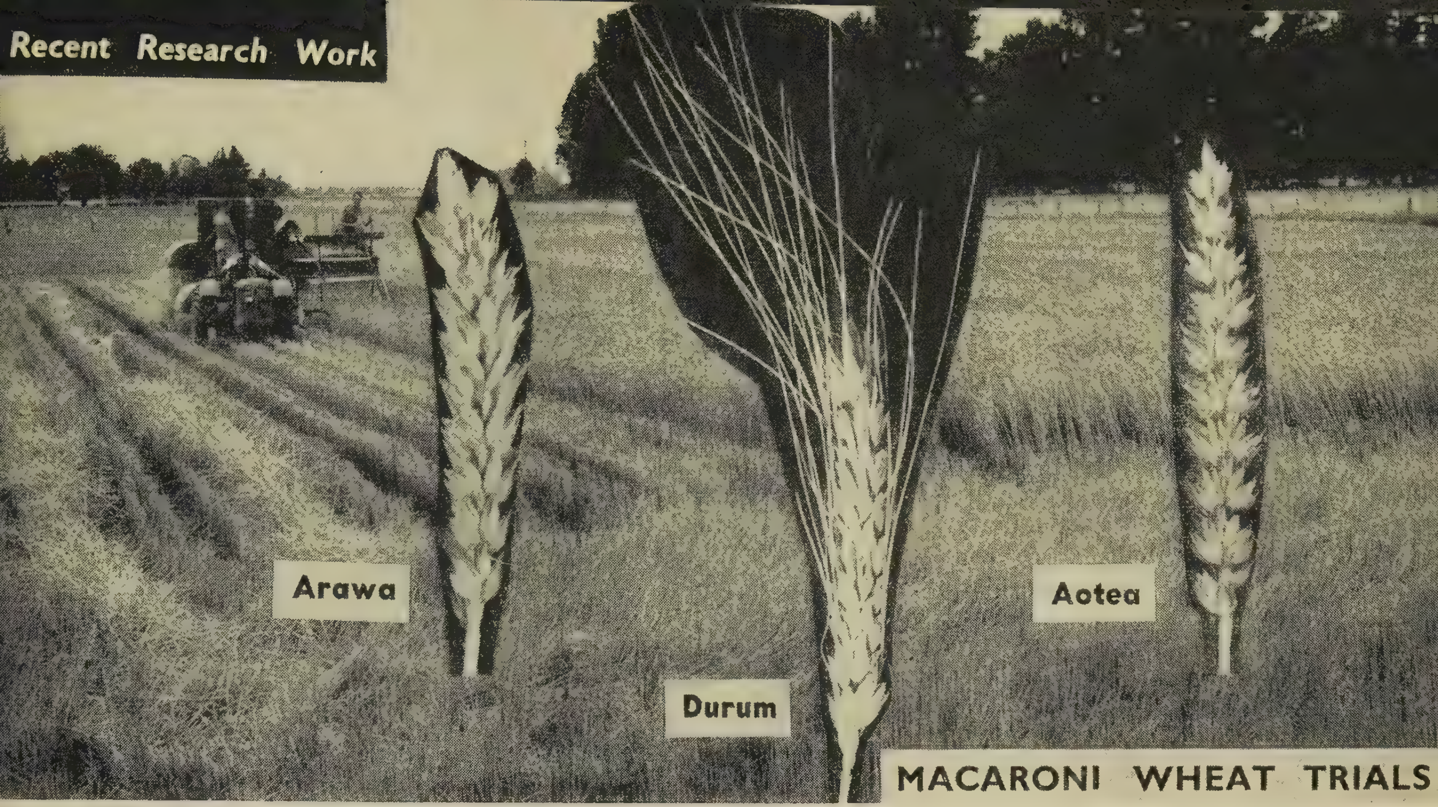
International Dairy Conference

MORE than 3,000 members are expected to attend the 15th International Dairy Congress to be held in London from 29 June to 3 July next year. The programme will consist of scientific and technical sessions.

The closing date for the receipt of application forms at the congress secretariat is 31 January 1959.

Mr M. H. Wallace, Assistant Director, Dairy Division, Department of Agriculture, Box 2298, Wellington C1, is congress liaison officer for New Zealand.

◆



MACARONI WHEAT TRIALS

THE Extension Division of the Department of Agriculture has recently carried out in South Canterbury trials to test the performance of different wheat varieties which may be suitable for the manufacture of macaroni.

QUALITIES DESIRED

FLOUR millers usually desire wheat which possesses a baking quality suitable for bread making. To satisfy this requirement the wheat breeder places some stress on good baking quality as an essential characteristic of most new varieties he produces. Because most New Zealand flour is used in the manufacture of bread, the importance of baking quality can be readily understood.

However, not all flour in New Zealand is used for bread making. The manufacture of macaroni, for example, requires flour with a high gluten content, and both local and imported Australian wheats are not entirely satisfactory for this. In an attempt to find a wheat suitable both for local farming conditions and for macaroni manufacture seven varieties were imported from the United States into South Canterbury in 1956.

VARIETIES

These durum varieties, as they are called, are used exclusively for macaroni manufacture in that country. To find out how they would perform under New Zealand conditions two trials were laid down at Timaru in the spring of 1957. One trial was drilled on heavy land, the seven durum varieties being compared with Arawa, while the other was drilled on medium rolling downs country, the comparison being with Aotea.

Both trials were drilled at 2 bushels per acre with 1 cwt. of superphosphate. The durum varieties (Towner, Mindum, Ramsey, Vernum, Sentry, Langdon, and Yuma) established well, but were much more prostrate in growth than the New Zealand varieties. Six weeks before harvest the seven varieties varied considerably in height but all were extremely flaggy in the leaf and as awned as barley. Compared with the New Zealand varieties the imported wheats were very fine in the stem, a characteristic which later proved to be a distinct disadvantage. Warm, wet conditions in South Canterbury during summer delayed harvesting and stimulated weed growth. On the heavy land all the durum varieties went flat and much fat-hen and cornbind grew both through and above them. Arawa was tall, erect, and unaffected. On the medium downs land some lodging occurred in the durums and volunteer red clover was a problem. In both trials, though the macaroni varieties had very large square heads, they failed to fill properly.

YIELDS

The yields in bushels per acre obtained in these trials after difficult direct heading were:

Heavy land—

Durums: Average yield 56 bushels; range 50-63 bushels
Arawa: 93 bushels

Medium downs land—

Durums: Average yield 32 bushels; range 22-42 bushels
Aotea: 54 bushels.

The yield of Aotea was reduced because of dwarf virus infection, which caused grain shrivelling in many heads.

Only two macaroni varieties (Mindum and Vernum) yielded over 40 bushels per acre in both trials.

CONCLUSIONS

The two trials were carried out under weather conditions which were extremely unfavourable for the imported varieties. The macaroni wheats sown were bred in Dakota, United States of America, where warm springs are usually followed by hot, dry summers. Though it is unlikely that Canterbury weather conditions will ever be identical with those in Dakota, it is possible that in a more normal summer these varieties would perform much better. A heavier sowing rate, for example, 3 bushels per acre, might also assist in the smothering of weeds, the growing of a more compact crop, and a reduction in lodging.

Further trials will be carried out this spring to find out whether the varieties do hold any promise. Unless they show much higher yields and better direct heading ability in the future, very heavy contract subsidies would be required to induce farmers to grow them.

—C. C. McLEOD

Early Weaning of Calves in Central Taranaki

By A. R. MURDOCH,
Livestock Instructor, Department of Agriculture, Stratford

RESULTS are given in this article of a small trial conducted last year at the Stratford Demonstration Farm to see if it was practical in Central Taranaki to wean calves at 8 weeks, using the method proved successful in extensive trials at the Department of Agriculture's Ruakura Animal Research Station.

THE trial showed that with the climatic conditions, which were better than average during the period up to weaning, and with sufficient good feed available, it was possible to rear really good calves fit for weaning at 8 weeks. It also showed, however, that it was not practical to wean them that year on the Demonstration Farm without using concentrates afterward.

The reason for this was the cold, wet, variable conditions in October and November, which slowed growth considerably, so that the good-quality pasture available lasted for only a limited period.

Under Ruakura recommendations the calves should not have been weaned at precisely 8 weeks unless plenty of good pasture was available to carry them through and rotational grazing management could be practised. Buttermilk powder was used in the trial, as this is commonly used as a substitute in calf rearing. It is expensive, but if good calves are to be reared, the full correct quantities as laid down in the Ruakura tables must be used. Successful early weaning, of course, does effect quite a saving in the quantity used.

The 15 calves on the farm, all born between 20 July and 20 August 1957, were divided at random into three groups of five. One group was reared on the early weaning schedule; the other two groups were used for another trial. The early weaning group had an average birth weight of 56½ lb. (ranging from 46 lb. to 65 lb.) and an average chest girth measurement of 27 in. (ranging from 26 to 28 in.).

All were born between 1 and 19 August. Colostrum milk was fed for 2 days, and then buttermilk powder at 28 oz. per calf per day. The powder was mixed with 7 pints of water and the calves were fed 3½ pints twice daily. There was no trouble getting the calves on to the powdered milk. After 7 weeks the calves were fed ½ lb. of calf pellets per day to get them eating this type of supplement freely in case it was required later.

The calves were weaned at 8 weeks. The average weight was 125 lb. and the average girth measurement 35½ in. This was well above the Ruakura standard of 120 lb. and 33½ in. which it is recommended all calves should reach before weaning. Rotational grazing was also carried out, but lack of suitable paddocks did place some limitation on it. Sufficient good-quality pasture was available.

The cost of feeding per calf until weaning was as follows: 96 lb. of buttermilk powder (£2 14s.) and 3½ lb. of calf pellets (1s. 5d.), a total of £2 15s. 5d. As a safeguard in case the weather did not improve for some time, pellet feeding was continued for 14 days after weaning at 1 lb. per day to try to make the quantity of good pasture available last longer.

Ten days after pellets were discontinued the suitable pasture was getting short and rotational grazing had to be restricted because all feed available was required for the herd. The calves lost their bloom and started to slip slightly, so pellet feeding was again started.

Throughout the trial the calves did not get any special treatment. The farm manager stated that they were given no more attention than any average farmer should give them. Scours did occur, but not seriously, and all cases were quickly cleaned up with antibiotics. The well-water supply was suspected as a possible cause of the scours and when boiled water was used to mix the powder the scours almost disappeared.

No calf-shed was used, the only shelter being barberry hedges. None of the calves was drenched, and it did not appear that this would be necessary.

Ruakura Standard System

Ten calves were reared on the Ruakura standard feeding system, special features of which are whole-milk feeding for the first 3 weeks, gradual replacement of whole-milk by separated milk during the next 3 weeks, separated milk for the next 10 to 12 weeks, and a gradual increase in the quantity fed from birth to the fourteenth week (gradual reduction thereafter until weaning at 16 to 18 weeks). Buttermilk powder was used, the daily quantity being gradually reduced to give a feed ranging in quality to equal with whole-milk down to skim milk.

The calves were all born between 20 July and 20 August, this being in accordance with the Ruakura recommendation that calves selected for rearing should be born before the end of August. They were fed whole-milk equivalent for 3 weeks, and the quality was then gradually reduced until it became skim milk equivalent at 7 weeks, and it continued as such until weaning.

Feeding started at 3 pints twice daily at 3 days and was increased by ½ pint per week to a maximum of 8 pints at 11 weeks. The feeding of 8 pints continued for 4 weeks and then was reduced to 4 pints for 2 weeks and further reduced to 2 pints for the last fortnight before weaning.

The average birth weight was 54½ lb. (ranging from 47 lb. to 68 lb.) and the average chest girth measurement was 27 in. (ranging from 25 to 27½ in.). At 8 weeks the average weight was 120 lb. (ranging from 112 lb. to 132 lb.) and the average girth measurement was 35 in. (ranging from 34 to 36 in.). Five of the calves were actually under the Ruakura weight standard, but all girth measurements were over the standard.

At this stage the calves had actually consumed 96 lb. of buttermilk powder, exactly the same amount as the calves in the early weaning group, despite the different daily quantities fed. They appeared no different from the early weaners and could be identified only because they had been tagged.

At 18 weeks, when weaned, the average weight was 242 lb. (ranging from 220 lb. to 286 lb.) and the average girth measurement was 44 in. (ranging from 43 to 47 in.). This was well above the Ruakura standard of 220 lb. and 40 in.

For comparison the early weaners were weighed and measured at 18 weeks, with the following results: average weight 214 lb. (ranging from 196 lb. to 232 lb.); average girth measurement 42½ in. (ranging from 41 to 44 in.). The average weight was below the Ruakura standard, but the average girth measurement was higher.

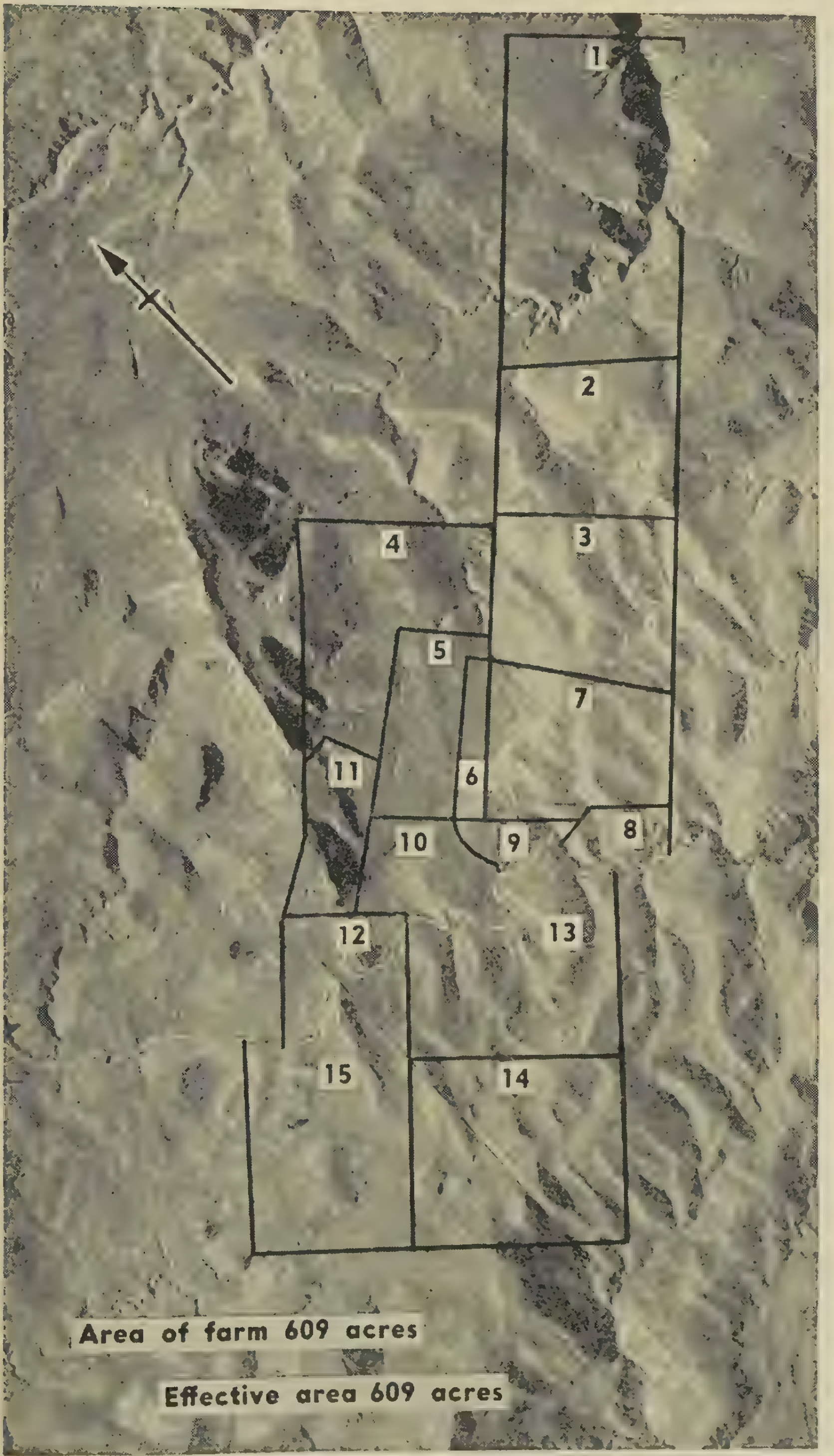
These weights and measures show clearly that at 18 weeks the late weaners were doing better than the early weaners. It is considered, however, that the restricted quantity of good-quality pasture that had been available to the early weaners and the limitation of rotational grazing due mainly to this factor were the main reasons for the difference. The cost of buttermilk to rear the group under the standard system was of course much greater, as they consumed 102 lb. of powder per head more than the early weaners. This cost £2 17s. 5d. The early weaners were fed calf pellets which cost 12s. per head, which reduced the extra cost to £2 15s. 5d.

For the first 8 weeks 5 of the calves in this group were covered and 5 left uncovered. A summary of the results is as follows:

	Covered group		Uncovered group	
	Average weight lb.	Average girth in.	Average weight lb.	Average girth in.
Birth ..	55	27	54	26¼
8 weeks ..	122	35	118	35

Though differences are not significant, the weather for the greater part of the period was much drier than is usual for that time of year.

Farm Production Records



Four Department of Lands and Survey aerial photograph prints were assembled so that this farm plan could be prepared. A map of a farm is invaluable when it is being developed. Original survey plans or ones such as that shown are suitable. The procedure for obtaining the aerial photographs is explained in this article.

By R. H. SCOTT,
Land Utilisation Officer,
Department of Agriculture,
Wellington

THE opinion frequently stressed that farming is firstly a way of life has perhaps had unfortunate consequences in that it appears to have fostered an attitude that the farmer is no businessman. In an economy like New Zealand's he must be a businessman; his livelihood depends largely on the sale of products on a discriminating overseas market and the price of these products is governed by the fundamental economic principle of supply and demand. Therefore the cost of producing each unit of product should be as low as possible to hold its own on, or to obtain a greater share of, the market. To do this the producer should be a businessman and look on his farm as a business.

AFTER all, the conception of farming as a business and farming as a way of life, and the farmer as a person with a genuine regard for soil and livestock, are not inconsistent. A businessman to be successful must protect his assets; that also should be the aim of a farmer. Soil and livestock are two of his main assets and should be maintained or improved. Pride in being a successful and enterprising farm businessman must surely imply a pride in the assets which enable success to be achieved.

Some form of management and accounting records are needed for the successful conduct of any business. Without some form of records designed to meet the requirements of the particular farm, diagnosis of the weak points within the farm enterprise becomes difficult. Correct diagnosis is a first step to rectification, and records properly designed and used can be the "X-ray".

For several years the Department of Agriculture has been using both management and accounting records to assist farm management advisory work, and in this article some of the management records evolved are described.

Farm Plan

Where a farmer is developing a farm, a map of the farm is invaluable. It is much easier to plan a new layout or subdivision with a farm map than on the ground. A map can also save much time when some types of work are being discussed with employees and can help to convey directions for the execution of work.

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Starting Records

ANY farmer who is interested in establishing production records for his farm can obtain assistance from field officers of the economics section of the Extension Division, who are stationed at Auckland, Hamilton, Palmerston North, Christchurch, and Dunedin.

Some farmers are fortunate in having a copy of the original survey plan of their farm, on which they may have plotted features such as subdivision fencing, location of buildings, farm tracks, and shelter belts. Without such plans it is often difficult to compile one that is satisfactory. However, now that a considerable part of New Zealand has been photographed from the air many farmers will be able to obtain aerial photographs covering their farms from the Department of Lands and Survey. For some farms one contact print 7 in. x 7 in. or 7 in. x 9 in., costing 18s., may be sufficient; for others several contact prints or enlargements of these may be necessary. The cost may be £5 or more.

Information about aerial photographs may be obtained by writing to the Surveyor-General, Department of Lands and Survey, Government Buildings, Lambton Quay, Wellington. If a description of the property is supplied, such as the rural section number, the block number, and the name of the survey district, a quotation will be given for the supply of an aerial photograph to cover the farm.

PADDOCK SHEET

Paddock Number or Name 7 Area 34 acres

Topography Steeply rolling, but can be disced

Description of Soil Silt loam

Year	Quantity and type of fertiliser and or lime applied and date applied	Description of pasture, crops and yields, date closed for hay or silage, quantity of hay, etc.
1948	Topdressed with 2 cwt. superphosphate per acre in March	Predominantly browntop, danthonia sward. Some Yorkshire fog, sweet vernal, and traces of cocksfoot. White clover present, but not vigorous
1949	Topdressed with 2 cwt. superphosphate per acre in March	
1951		In June the paddock was cleared of scattered tree stumps and disced with giant discs
1952	1 ton lime and 2 cwt. superphosphate per acre applied in April at sowing down	In April paddock disced with tandem discs, worked down, and sown to pasture with mixture of 25 lb. perennial ryegrass, 7 lb. short-rotation ryegrass, 6 lb. cocksfoot, 2 lb. Mont. red clover, 2 lb. white clover, 2 lb. subterranean clover
1953	Topdressed with 2 cwt. superphosphate per acre in March	
1954		August: Pasture is now a good ryegrass, white clover, subterranean clover pasture. Short-rotation ryegrass is still present and is contributing a fairly large amount of feed

On the aerial photograph the boundary and internal fences should be marked in a distinctive colour, such as black. It is usually possible to discern these fencelines on the aerial photograph. Where farmers name paddocks or blocks these names can be inserted, or if names are not used, paddocks or blocks should be numbered.

At the foot of the map or aerial photograph the **total farm area** and **effective farm area** can be marked. The latter is the acreage used to compute some of the physical production indices, such as butterfat per acre or wool per acre. Definitions of effective farm area can differ, but the Department has defined it as "the total area of the farm as shown by the Certificate of Title to the property less the area of land which cannot be farmed and used by livestock for any part of the year". Though the area taken up by the farm dwelling and other farm buildings is not really used for the production of farm products, this area is not deducted when assessing the effective farm acreage. It is regarded as the servicing area to the farm and thus contributing indirectly to production from the land.

Paddock or Field Sheet

The paddock or field sheet provides a permanent record of cropping, fertiliser use, etc., on each paddock from year to year. Details of yields of crops, hay, etc., can also be noted on the form. When questioning farmers about the previous history of a paddock officers of the Department frequently find that details cannot be remembered for many years back. The paddock sheet eventually forms a historical record for the paddock, and this record can sometimes assist in determining the reason for poor results on a paddock. Paddock sheets can be bound together so that there is one sheet for each paddock or block on the farm.

Paddock Grazing Sheet

Where a farmer is developing a property the only way in which he can sometimes assess whether or not the expenditure on a particular paddock or block is giving a satisfactory economic return is to know the number of additional stock being carried as a result of the improvement. This can be done by noting in a diary the day on which a specified number and class of stock were placed in a paddock or block and the date wher they were removed. However, as the extraction of this information from a diary to assess the annual carrying capacity of the paddock or block can be tedious, a form (portion of which is shown at left on page 357) was designed to enable information to be assembled more quickly. One form is required for each month, and the

NOW!

9 out of 10

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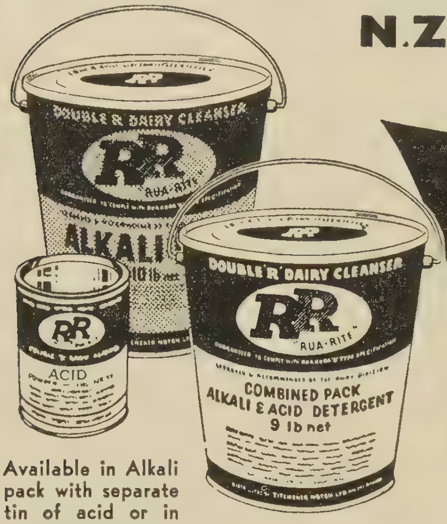
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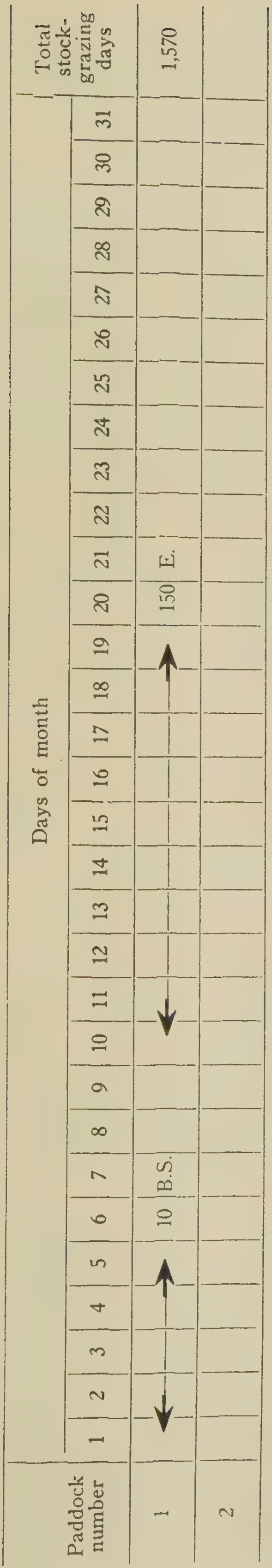

PADDOCK GRAZING RECORD

Paddock number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total stock-grazing days
1						10 B.S.														150 E.												1,570
2																																

Days of month

[*Continued as required according to number of paddocks*]

practice is to bind together 12 forms sufficient for the farming year.

Instructions

The instructions for completing the form are as follows:

(a) The paddock or block numbers on the record sheet should correspond with those on the farm plan.

(b) The classes of stock should be shown, the following abbreviations being used:

Dairy cows, cows and heifers in calf	M.C.
Dry dairy stock	D.C.
Heifers (1-2 years)	H.
Calves	C.
Bulls	B.
Breeding ewes	E.
Other sheep	S.
Beef cows or steers (2 years +)	B.S.

(c) If 100 breeding ewes were grazed in Paddock 1 from the seventh of the month until the fifteenth of the month, the method suggested is to draw a line from the middle of square 7 to the middle of square 15 and at the end of the line mark 100 **E.**

To arrive at the figure giving the total stock grazing days for each paddock for the month all stock must be converted to a common unit—for a sheep farm this is usually taken as the **breeding ewe** and for a dairy farm the **dairy cow in milk.**

The stock-conversion factors used by the Department in its farm management advisory work are as follows:

Dairy farms:	**Stock unit**
Dairy cow in milk	1.0
Dry dairy cow	0.7
Heifer (1-2 years)	0.6
Calf (to 1 year)	0.25
Bull	0.8
Sheep farms:	
Breeding ewe	1.0
Other sheep (wether, dry ewe, etc.)	0.7
Ram	0.75
Beef breeding cow	5.5
Heifer (1-2 years)	4.0
Calf (to 1 year)	2.0
Steer (2 years +)	5.5
Breeding bull (2 years +) ..	5.0
Dairy cow in milk	6.0

The portion of the form at left shows that in Paddock 1 (55 acres) 10 steers (2 years +) were carried for 4 days from the first to the fifth of the month and 150 ewes for 9 days from the tenth to the nineteenth of the month. If all stock are converted to the equivalent of the breeding ewe, there were 220 stock grazing days (10 × 5.5 × 4) for the cattle and 1,350 stock grazing days (150 × 9) for the ewes, a total of 1,570 stock grazing days in Paddock 1 for the month. To trace over a period the effect of an improvement programme on the carrying capacity of a paddock the information can be brought together on the following lines:

Livestock Record

The livestock record form is designed to show the number of stock on hand at the end of each farming year, which is usually 31 March or 30 June. Provision is made for converting the various classes of stock to the stock unit—the **breeding ewe** or the **dairy cow in milk.** At the foot of the form "Stock units per acre" can be computed. For dairy farms it is usual to compute this as "Dairy cows in milk per 100 acres". Provision can also be made for the quantity of wool sold each season and wool per acre.

The portion of a form on page 359 sets out the figures for 2 years for a hill-country farm of 609 acres, all of the area being classed as effective acreage. (The actual form accommodates 3 years' results.)

Lamb Record

Where the sale of fat lambs is the main feature of farming the amount of meat produced from the farm partly governs success, though high production per unit of area does not necessarily mean that the optimum net financial returns per acre are being obtained. High physical production can sometimes be obtained at too great a cost. However, as land is the fixed resource in a farm enterprise, production per acre is naturally important.

The form which has been designed to record details of lamb sales makes provision for computing average lamb weights for a season as well as lamb meat per acre. Details of the form are given on page 358.

The form gives details for a fat lamb farm of 220 acres. The percentages at the top of the form were computed as follows:

Tailing percentage =

$$\frac{\text{Number of lambs tailed}}{\text{Number of ewes to ram}} \times \frac{100}{1}$$

Fat off mothers percentage =

$$\frac{\text{Number of lambs drafted off mothers}}{\text{Number of lambs tailed}} \times \frac{100}{1}$$

Deaths (percentage of deaths) =

$$\frac{\text{Number of deaths recorded after tailing}}{\text{Number of lambs tailed}} \times \frac{100}{1}$$

For this farm no details were available of the number of lambs born, and frequently farmers cannot give this figure, nor can they give details of lamb deaths occurring between birth and tailing.

Butterfat Record

The monthly butterfat production can be taken from the factory statements, and provision is made on the form for noting the cumulative total.

Paddock	Area	1955-56			1956-57		
		Total stock grazing days for year	Stock grazing days per acre for year	Stock units per acre	Total stock grazing days for year	Stock grazing days per acre for year	Stock units per acre
1	acres 55	(a) 39,523	(b) 718.6 (a ÷ 55)	2.0 (b ÷ 365)	45,310	823.8	2.3

LAMB RECORD

1954-55

Ewes to ram	875	Lambing	%
Lambs born		Tailing	105.8%
(a) Lambs tailed	926	Fat off mothers	34.4%
(b) Lambs bought	88	Deaths	5.3%
Total (a) and (b)	1,014		

Date of draft	No.	Total weight	Average weight	Receipts
		lb.	lb.	£ s. d.
13.1.55	78	2,754	35.31	219 13 0
29.1.55	241	7,937	32.93	641 13 0
11.3.55	134	4,633	34.57	398 9 0
9.4.55	85	2,762	32.49	249 14 0
4.5.55	83	2,835	34.16	253 3 0
Total to works	621	20,921	33.69	1,762 12 0
Other fat lambs sold				
Ewe lambs kept Others kept Deaths	328 16 49			
Total	1,014			

Lamb meat per acre .... 95.1 lb.

1955-56

Ewes to ram	956	Lambing	%
Lambs born		Tailing	121%
(a) Lambs tailed	1,157	Fat off mothers	23.9%
(b) Lambs bought		Deaths	1.7%
Total (a) and (b)	1,157		

Date of draft	No.	Total weight	Average weight	Receipts
		lb.	lb.	£ s. d.
9.11.55	27	809	29.96	101 7 0
3.12.55	123	3,935	31.99	364 3 3
12.1.56	126	3,994	31.70	397 6 3
9.2.56	255	8,543	33.50	752 5 0
11.2.56	21	694	33.05	65 0 5
22.3.56	210	7,029	33.47	478 16 0
Total to works	762	25,004	32.81	2,158 17 11
Other fat lambs sold				
Ewe lambs kept Others kept Deaths	375 20			
Total	1,157			

Lamb meat per acre .... 113.7 lb.

PIG RECORD

Farrowings

	1st Litter			2nd Litter		
	Date farro'ed	No. born	No. weaned	Date farro'ed	No. born	No. weaned
Sow A						
	[Continued according to number of sows]					
Total						
Average No. pigs farrowed per litter			....			....
Average No. pigs weaned per litter			....			....
Pigs weaned as percentage of No. born			....			....

Pigs sold

Date	No. porkers	No. baconers	Weight of porkers	Weight of baconers	Receipts
Total					

Total pigmeat ....lb.
Average weight of porkers ....lb.
Average weight of baconers ....lb.
Pigmeat per 100 lb. butterfat ....lb.

There is space for 6 years on a sheet. This enables quick comparisons to be made between one year and another. To assess the true annual butterfat production it is necessary to make an addition to the annual production disclosed by the factory returns to allow for milk used in the farm home, by farm employees, and for whole milk fed to calves.

If the farmer does not know the amount of milk used per day by those living on the farm, an assessment can be made based on the average New Zealand consumption of milk per head of population. At present this is about 45 gallons per annum, which converted to butterfat on a test of 4.6, gives approximately 21 lb. of butterfat per person per year.

The amount of whole milk fed to calves should also be converted to butterfat. For instance, if calves were reared on the Ruakura Animal Research Station system of weaning at about 8 weeks and fed whole and separated milk, a total of approximately 31 gallons of whole milk was fed to a calf. Converted to butterfat on a test of 4.6, this is equivalent to about 15 lb. of butterfat per calf fed. Therefore, if 8 calves were reared, an additional 120 lb. of butterfat should be added to the factory total.

To arrive at "Butterfat per cow" total production is divided by the number of cows which milked for 100 days or more during the season.

Below (at left) are shown details entered on the form for two seasons for a 113-acre Taranaki farm (the actual form accommodates details for 6 seasons).

LIVESTOCK RECORD

Class of stock	Conversion factor	1956		1957	
		No.	Stock units	No.	Stock units
Ewe hoggets	1.0	450	450	395	395
2-tooth ewes	1.0	300	300	300	300
Ewes 4 tooth and over	1.0	585	585	750	750
Wether hoggets	0.7	250	175	390	273
Other wethers	0.7	25	18	10	7
Rams	0.75	15	11	17	13
Oddments, killers	0.7				
Total sheep		1,625		1,862	
Dairy cows	6.0	3	18	2	12
Heifers (under 1 year)	2.0				
Heifers (1-2 years)	4.0				
Bulls	5.0				
Total dairy stock		3		2	
Breeding cows	5.5	40	220	70	385
Heifers (under 1 year)	2.0	29	58	17	34
Heifers (1-2 years)	4.0	29	116	29	116
Steers (under 1 year)	2.0	31	62	17	34
Steers (1-2 years)	4.0	14	56	24	96
Steers (2 years plus)	5.5	13	72	23	127
Bulls	5.0	3	15	3	15
Total beef stock		159		183	
Other stock (specify): Hacks	7.5	2	15	2	15
Total		2	2,171	2	2,572
Stock units per acre			3.6		4.2
Wool (lb.)			20,036		24,580
Wool per acre (lb.)			32.9		40.4

BUTTERFAT RECORD

Month	1955-56		1956-57	
	Butterfat for month	Cumulative total	Butterfat for month	Cumulative total
	lb.	lb.	lb.	lb.
July	68			
August	1,069	1,137	1,388	
September	2,069	3,206	2,399	3,787
October	3,033	6,239	3,088	6,875
November	3,364	9,603	3,423	10,298
December	3,328	12,931	3,366	13,664
January	2,973	15,904	3,226	16,890
February	2,475	18,379	2,687	19,577
March	2,337	20,716	2,578	22,155
April	1,691	22,407	1,954	24,109
May	1,011	23,418	1,168	25,277
June		23,418	93	25,370
Allowance for milk used in farm home and fed to calves	620		300	
Year		24,038		25,670
B/F per cow		316		321
B/F per acre		213		227

Pig Record

As the production process for pigs is much more intensive than that for cattle or sheep and considerable waste can occur, keeping of both production and financial records is very important. The form on page 358 has been devised to set out some of the salient production features and to indicate the physical efficiency of the piggery.

Production records are a useful management aid only when the forms are designed to give information of use in guiding the business. Moreover those shown are not claimed to be the best that could be devised. Individual farmers will no doubt be able to simplify or otherwise improve them.

Production Standards

Eventually the Department of Agriculture hopes, with the cooperation of farmers, to be able to establish some production standards for various sizes of farms on specific classes of land. These standards would enhance greatly the value of production records. A farmer could compare his results with standards for his land class and if he falls short, may find where his management is faulty.

◆

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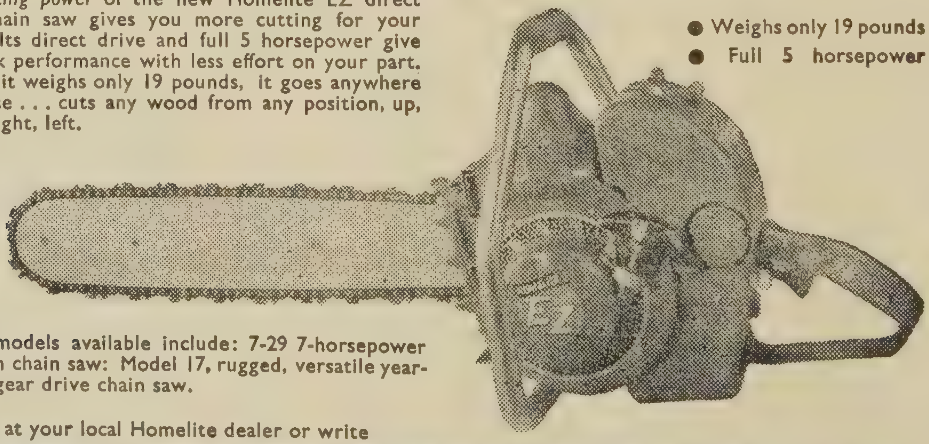

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1080 POISON

Outstanding Animal Pest Destroyer

By I. G. McINTOSH,
Principal Scientific Officer, Department of Agriculture Animal Research Station, Wallaceville

SODIUM monofluoroacetate (1080) has been proved during the last 15 years to be an extremely effective poison against warm-blooded animal pests in America. In Australia and New Zealand it is being used successfully against the rabbit. Its properties are such as to commend it for the control of all mammalian pests and as it is likely to be used more widely in this country in the future, it is desirable that farmers, hunters, and others should be informed about its nature and properties.

THE compound was made in the laboratory last century, but nothing seems to have been recorded about its poisonous properties until 1944, when a South African scientist named Marais reported that 1080 was the poisonous substance in a South African plant which had caused a great many deaths of stock.

This plant, called *Dichapetalum cymosum*, was recognised as poisonous as long ago as 1890 and much work was done on it from that year until the successful identification of its poison by Marais.

During the Second World War workers in both America and Britain studied the poisonous properties of monofluoroacetates independently of Marais and in 1945 American scientists reported on the valuable properties of 1080 as a poison for rats and other pests.

Since then a large amount of scientific work has been done on this poison and a great deal is now known about its action within the body.

Except in minor points, all that follows about 1080 is applicable to a similar poison 1081 (monofluoroacetamide), which is a variation of 1080, with the essential difference that 1081 is less poisonous than 1080.

Lack of Taste and Smell

Pure 1080 is a fine, fluffy white powder which has no smell and in dilute solutions no taste. This lack of taste is probably the factor contributing most to its success as a pest poison. It is very stable and in baits or poisoned carcasses the poison does not decompose but remains potent until it is dissolved out of baits by rain or until the carcasses decompose and the poison is washed into the soil. Some of the poison is changed, however, in the living body during the poisoning process.

No Effective Antidote

Though much effort has been directed toward the development of an effective antidote for the poison, one has not been found. The powder dissolves readily in water and if it is left exposed to air, it absorbs moisture. The moist poison and solutions of it are corrosive to tins and, in use, solutions are best stored in plastic containers in order to prevent any possibility of leakage. Owing to the risk of breakage glass bottles are unsuitable for storing 1080 solutions.

Assessing Long-term Results

Before any poison is used widely it is important that its effects on man, on domestic animals, and on wild animals and birds which it is desirable to preserve should be known so that the long-term results of its use can be assessed. Sufficient is known about 1080 for such an assessment to be made.

Different warm-blooded animals and birds require different amounts of the poison to affect them and a list can be made showing increasing susceptibility to the poison. In this list equal body weights are taken into account and it is: birds, man, horse, rabbit, goat, sheep, opossum, pig, cat, and dog.

The fatal dose for man is not known with certainty, but is computed to be between 25 and 60 times that for the same weight of dog, for which the fatal dose has been determined accurately, and between 4½ and 11 times that for the same weight of sheep. In this discussion it is intended to err on the safe side by taking the figures 25 and 4½ respectively. The fatal doses for deer and cows have not been established, but are likely to be similar to those for the same weights of sheep and goats.

In the consideration of the possible danger to human life three categories must be dealt with:

1. The user of the poison.
2. The man who eats the flesh of an animal which has eaten the poison but is still not showing the effects of it when killed; the man who drinks water contaminated by poisoned baits or poison from carcasses of animals killed by it.
3. The child who eats a poisoned bait.

The User of the Poison

As far as users are concerned, it must be emphasised that 1080 is a very potent poison if sufficient enters the body and there is the disadvantage, mentioned earlier, that no completely effective antidote for it is known.

If a person should swallow any accidentally, an immediate emetic followed by medical attention is necessary. If treatment is delayed until severe symptoms of poisoning appear, the victim is almost certain to die.

The poison is definitely not suitable for use by people not trained to handle it with the care it warrants. There is some evidence that it is absorbed through cuts and bruises and this point is important when solutions of the poison are handled.

A point in favour of 1080 and an advantage over both arsenic and phosphorus is the fact that experiments with animals have shown that 1080 is not a cumulative poison and that repeated small doses are without effect. A further advantage over both phosphorus and cyanide is that 1080 does not give off any poisonous fume or vapour.

It is generally agreed that real danger to users of the poison is present only during the handling of the powder or solutions of it. The poison is so potent to warm-blooded animals that only very small amounts have to be used in the final bait materials. By this time the poison is so diluted that there can be virtuallly no danger from accidental poisoning in handling the baits. Some comparisons with other poison baits follow.

With the level of 1080 used at present in carrot bait a probably fatal dose for a man is contained in 12 oz. of the bait. In 1080 pellets used in experimental opossum poisoning by officers of the New Zealand Forest Service the corresponding amount for a man is 4½ oz. White arsenic has

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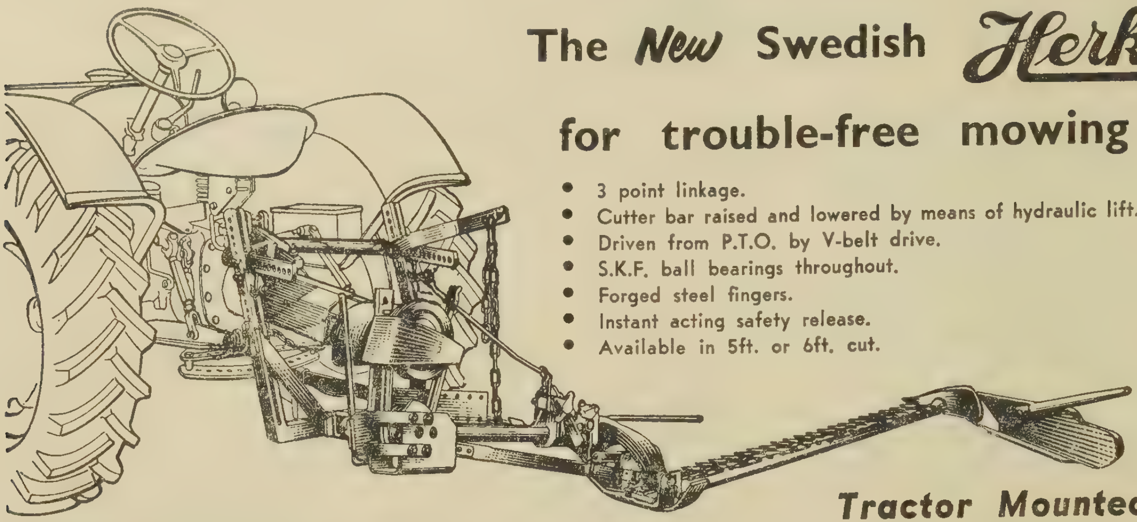

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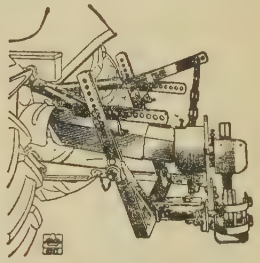

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been used extensively in rabbit destruction and with this material there has been a probably fatal dose for a man in under 1 oz. of bait. The corresponding amount of phosphorus bait containing 1 per cent of yellow phosphorus is 3½ oz.

These examples show that 1080 baits are less dangerous in their poison content than those containing the older poisons. Men using the poison in New Zealand are well aware of its dangers and observe appropriate precautions in handling it.

> **Experience in Australia and New Zealand has shown that 1080 in the hands of trained men is safe for the user.**

Eating of Flesh of Poisoned Animals

The next consideration is of the man who eats the flesh of an animal which has eaten the poison but is still not showing the effects of it when killed; the man who drinks water contaminated by poison baits or poison from carcasses of animals killed by it.

Work has been carried out at Wallaceville to obtain data on the toxicity of meat in animals poisoned with 1080. A rabbit was poisoned with as much 1080 as it could obtain from 1 oz. of rabbit bait. During field poisoning a rabbit would be unlikely to eat more. It died in 1¾ hours and was skinned, gutted, and the head removed.

The carcass was fed to a 26½ lb. dog and was eaten completely in a few hours. The dog showed no observable effects. The great sensitivity of the dog makes it an excellent test animal for 1080 and in this instance the amount of 1080 fed to the rabbit originally would have killed 10 dogs of the size used.

There is no doubt that the dog would have been killed if it had eaten the entire carcass including the gut contents, and the result obtained indicated that the meat was not hazardous to a dog and would not be likely to be dangerous to a man.

A small hogget was then poisoned with 20 lethal doses of 1080 (17 oz. of rabbit bait or 7 oz. of experimental opossum bait) and died in 2 hours. The carcass was dressed and washed carefully so that the unabsorbed poison from the gut would not contaminate the meat, which was then fed at different levels in one feed to five dogs.

Two of the dogs died with typical symptoms of 1080 poisoning and two of three others receiving lower levels showed no effects. The fifth dog, receiving an intermediate level, was very slightly affected in that it was a little depressed on the day after eating the meat, but it did not show the physical symptoms of 1080 poisoning. It had recovered completely on the following day.

This dog will be considered in more detail. It weighed 30 lb. and had received 9½ oz. of the poisoned meat. If the meat had contained only fluoroacetate as poison, it can be calculated, knowing the relative susceptibilities of men and dogs to 1080, that 70 lb. of the meat, in one feed, would be required to affect a man.

When 1080 poisons it does not do so directly, but some of it must be first converted, within the body, to a compound called fluorocitrate, which causes the poisoning. It is not known in the case of the meat from the poisoned sheep how much of the poison that killed or affected the dogs was fluoroacetate and how much was fluorocitrate; neither is it known how differently men and dogs react to fluorocitrate taken by mouth.

It is likely that the sheep meat contained a mixture of the two compounds. The fluoroacetate present would not affect a man as it would a dog, but it cannot be stated with any certainty that the fluorocitrate present would not affect a man more than it would a dog.

In the sheep poisoning experiment the animal was allowed to die and was not killed before it showed symptoms. It is probable that the meat contained more poison than if it had been slaughtered.

It is likely that both goats and wild pigs would eat opossum baits, but whether deer would do so could only be answered by field experiments. Unless the point about the danger from poisoned meat can be settled satisfactorily, hunting in 1080 poisoned areas and their surroundings should be prohibited, or if this cannot be done, adequate warnings should be given to hunters.

Baits Polluting Water

The possibility of poisoned baits polluting water will now be considered. The highest levels of 1080 used in New Zealand have been in pellet baits used in the experimental opossum poisonings mentioned earlier.

The following discussion will be based on these baits, rather than on the more lightly poisoned rabbit baits. Assume the opossum baits to be spread at the rate of 5 lb. per acre. The poison would have to be leached out by rain before water could be polluted. If all the poison were leached out by 1 in. of rain (and it would probably require more) and this rain all entered a dry watercourse, a man drinking 1 pint of the water could receive no more than about 1/10,000th part of a fatal dose for him. Put another way, there would be a fatal dose for a man in 1,250 gallons.

The risk to a man drinking even ½ gallon of the water would be much less than the risk in eating an apple sprayed with arsenate of lead but still conforming to the requirements in New Zealand, under the Foods and Drugs Act, for arsenic residue. Even if half the inch of rain were evaporated before it reached the watercourse, the residual water would not have other than the minutest amount of 1080 in it.

Can carcasses of 1080 poisoned animals on the edges of streams cause a poisoning hazard to a man drinking water from the streams? If a wild pig, for example, should eat the whole 5 lb. of the bait dropped on an acre, it would have in it enough poison to kill perhaps 18 men.

Thirst is not a symptom of 1080 poisoning and animals suffering from the effects of it would not tend to seek water, but, nevertheless, suppose the pig should die on the edge of a stream.

The carcass would decompose in time and the contained poison would leach out and enter the stream. This leaching process would obviously take a long time, but even if one supposed all the poison to be liberated at once into a stagnant pool containing as little as 100 gallons of water, there would, even then, only be a fatal dose of 1080 for a man in 5½ gallons of the water. One hundred gallons of water would be contained in a pool 4 ft. x 4 ft x 1 ft. deep. With any flow of water at all through the pool, the concentration of poison would be reduced very rapidly below the already harmless level.

> **It would be impossible for any poisoned carcass, or even many of them, to create any poisoning hazard to man through pollution of streams with 1080.**

Consideration will now be given to the matter of poisoned baits falling directly into a stream. In a stream 3 ft. wide an area of 1 acre of the stream is equivalent to a length of 2¾ miles. Assume as before, that 5 lb. of the more heavily poisoned opossum baits fall directly into this acre of stream. The poison would be leached out of the baits fairly quickly in a stream and there could be sufficient poison in the whole length of the stream to kill 18 men.

If the depth of the water averaged 6 in. the volume in the 2¾ mile stretch would be 136,000 gallons and there would be a fatal dose of 1080 for a man in 7,500 gallons. Even if 50 lb. of bait instead of the intended 5 lb. fell into the acre of stream, there could still only be a fatal dose for a man in 750 gallons.

The whole 50 lb. would have to fall into a stagnant pool of about 150 gallons capacity to make ½ gallon of water dangerous to man. Poison from baits falling on the land bordering the stream would not enter the stream until long after the poison falling directly into the stream had been washed away.

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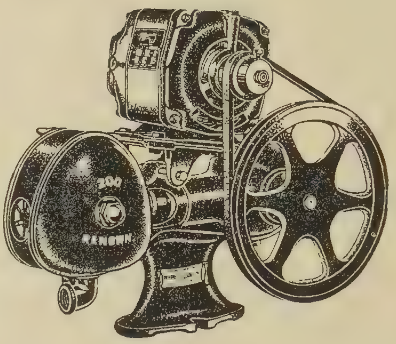

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For a narrow stream fewer baits would fall directly into the water and the concentration of poison in the water would be the same as for the 3 ft. wide stream, provided, of course, the depth was 6 in.

Even if the normal 5 lb. of baits were dropped into an acre of a tiny rill ½ in. deep, 600 gallons of water would be required to give a poisonous dose of 1080 to a man. Pilots of bait-dropping aircraft are too skilled to drop much more than the desired amounts in given areas, but it will be seen from the above examples that there is an enormous margin of safety in the event of mechanical failure in the bait hopper apparatus leading to the dropping of high amounts of poison.

It is concluded that no possible poison hazard to man from drinking water could be produced by the dropping of 1080 baits at the levels now in use for rabbit destruction or effective against opossums even on land serving as water catchment areas or directly into streams. As a corollary to this it is also obvious that substantial amounts of 1080 baits dropped inadvertently into a reservoir could not produce any poisoning hazard whatsoever to humans drinking the water.

The Child Who Eats a Poisoned Bait

The last case is that of a small child who eats a bait. About 1 oz. (four pellets) of opossum bait could seriously endanger the life of a small child, though a single bait would be unlikely to cause any symptoms. Though there is always some hazard if children gain access to poison materials, it will be clear from data presented earlier that 1080 baits are certainly no more dangerous than arsenic and phosphorus baits already in use, often near farmhouses.

Danger to Sheep

Turning now to animals, what are the dangers to sheep following rabbit poisoning operations? With the amount of 1080 used in carrot, a sheep weighing 100 lb. is killed by 1¾ oz. of fresh carrot bait. When 2 lb. of poisoned carrot per acre are used it is evident that quite often enough bait per acre is left to poison a few sheep. It is not known exactly how much rain is required to dissolve out sufficient poison from baits to make them safe for sheep.

This is not a simple problem, for a sheep eating a large amount of bait containing a very low level of poison is affected similarly to one eating a small amount of bait containing a high level. It is known that heavy rain is needed to dissolve the majority of the poison out of carrot bait.

The author believes that a lower level of 1080 than is used at present could be effective against the rabbit, and that by using a lower level and carefully judging the amount of poisoned bait to use in each operation, the poisoning hazard to sheep could be lowered to the extent that it might be feasible to poison rabbits effectively by spreading 1080 poisoned baits from the air and return sheep to the poisoned areas in 2 or 3 days.

If this could be done, a major advance in technique would be made. Until this point is tested experimentally it is necessary that sheep be kept off poisoned areas until (a) there has been a substantial fall of rain, or (b) poison baits have decomposed or weathered away.

Danger to Dogs

The extreme sensitivity of dogs to 1080 makes their protection a matter of considerable importance. A dog weighing 35 lb. is poisoned by the same amount of 1080 as a rabbit weighing 3½ lb. In field poisoning of rabbits it would be exceptional for a rabbit to eat only one lethal dose. The lapse of time before 1080 affects rabbits and other animals gives ample opportunity for the eating of many lethal doses of the poison.

It follows that any dog eating an entire poisoned rabbit is bound to receive more than a fatal dose of poison. As described earlier, dogs can also be killed by the meat from larger animals poisoned by many lethal doses of 1080.

▼ Such is the skill of pilots of aircraft dropping poisoned bait that there is little risk of more than the desired amounts falling in given areas. However, experience in the use of 1080 indicates that there is an enormous margin of safety in its use and that baits are less dangerous in their poison content than those containing the old poisons. Ayton Studios photo.

Dogs are extremely sensitive to 1080 and should be kept under close control during poisoning operations.

However low the level of poison in rabbit bait can be reduced, the danger to dogs will persist. Farmers would do well to note this point and keep dogs under close control during 1080 poisoning operations. Adequate feeding tends to prevent dogs from eating rabbits, and valuable dogs, prone to eat them, might be worth muzzling at times when they are not under direct control and when 1080 carcasses are still accessible to them.

Pig hunters' dogs would be endangered in areas where any 1080 poisoning operations were being conducted and until such time as carcasses of poisoned animals had decomposed.

Resistance of Birds

Birds as a group are more resistant to 1080 than most mammals but can still be poisoned by it. In rabbit poisoning trials the author has noted the poisoning of a few blackbirds. From trials and observations by Forest Service officers there is good reason to believe that birds can be protected almost completely by the careful selection of bait materials and by colouring the baits with appropriate dyes. The only way in which this can be established is by further experiments in the poisoning of opossums in forest areas, with close observation on the effect on bird life. Taking a broad view of this problem, it might well be a good proposition to risk the poisoning of a few birds for the advantages to be gained by saving from destruction by forest pests the trees providing food for birds. This is a matter for biologists to assess.

Conclusions

To summarise 1080 is an extremely potent poison, but is used in such small amounts that after the first step of dissolving the powder and diluting strong solutions of the poison there are no greater hazards in using it than there are in handling other effective pest poisons.

In the amounts used for rabbit destruction and, experimentally so far, for opossum poisoning it cannot produce any poisoning hazard to human life through pollution of water in streams.

It presents no more danger to a young child than do the older poisons still in use.

Special measures must be taken to prevent dogs from eating carcasses of animals poisoned by 1080. Meat from a heavily poisoned sheep carcass has been shown to be poisonous to dogs, and it is not clear whether or not such meat, or that from a deer or goat, could in any circumstances be poisonous to man.

There is every likelihood of bird life not being adversely affected through the widespread use of 1080 against opossums and other pests in forest areas.

Experience in New Zealand and overseas has shown it to be an extremely effective pest poison and such disadvantages as it possesses are more than offset by its advantages.

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during July 1958 and for the year ended 31 July 1958 with comparative figures for July 1957 and the year 1956-57 have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:

BUTTER

Period	Creamery (tons)	Whey (tons)	Total (tons)	Percentage inc. or dec.
July 1958	3,027	1	3,028	—
July 1957	2,172	5	2,177	—
Increase or decrease	+855	—4	+851	+39.09
12 months ended 31/7/58	174,287	2,867	177,154	—
12 months ended 31/7/57	154,161	2,909	157,070	—
Increase or decrease	+20,126	—42	+20,084	+12.787

Butter in store at 31 July 1958 was 4,808 tons

CHEESE

Period	White (tons)	Coloured (tons)	Total (tons)	Percentage inc. or dec.
July 1958	102	—	102	—
July 1957	37	—	37	—
Increase	+65	—	+65	+175.67
12 months ended 31/7/58	77,799	13,251	91,050	—
12 months ended 31/7/57	79,823	10,357	90,180	—
Increase or decrease	—2,024	+2,894	+870	+0.965

Cheese in store at 31 July 1958 was 9,799 tons

If these figures are converted into butterfat equivalent, there is an increase of 10.357 per cent in butterfat graded for the year as compared with the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place they are not necessarily a true indication of production trends.

Seasonal Notes for the Domestic Beekeeper

Dividing Hives for Increase

By D. A. BRISCOE,

Apiary Instructor, Department of Agriculture, Tauranga

THE number of hives in an apiary may be increased fairly simply provided the right time of the year and favourable conditions are chosen. Unfortunately, some beekeepers with insufficient experience try to increase the number of hives too rapidly or at the wrong time, with sometimes disastrous results. The best time to carry out this work is in spring, when colonies have an expanding brood nest and there is a little nectar coming in.

IF the division is made too early in the season, there may be a risk of chilling if there is a cold spell. Under favourable conditions and about 8 to 10 weeks before the main honey flow there is no reason why a strong colony should not be split in halves in time for both portions to build up to maximum strength to ensure a crop of honey from each.

For autumn increase a little more experience is required and until this is gained the small domestic beekeeper should not try to increase at this time.

Dividing Hives

Hives should have at least two full boxes of bees and brood before an increase is attempted. This is very important, as all too often domestic beekeepers divide weak hives, with the result that both hives die or are robbed out, leaving the beekeeper without a colony or doubting whether beekeeping is worth while.

Strong hives selected for division should first be examined thoroughly for any signs of American foul brood. This serious bee disease has often been spread by careless beekeepers splitting diseased hives for increase or transferring brood from them to other colonies.

Young queens or ripe queen cells should be available for introduction to the divisions when an increase is being made. Young laying queens, if preferred, can be ordered from a queen breeder to be delivered at a time suitable for this work. The use of swarm cells from an ordinary hive is not recommended, as queens obtained in this way are usually inferior. Specially prepared cells, however, are quite satisfactory.

One way of ensuring plenty of good cells is to locate and remove the queen from a good hive with a frame of brood and bees and place her in a nucleus box for safe keeping. When the bees of the parent hive realise they are queenless, they immediately begin building queen cells. On the ninth or tenth day these cells are ready for use and when the division is made each portion is given one.

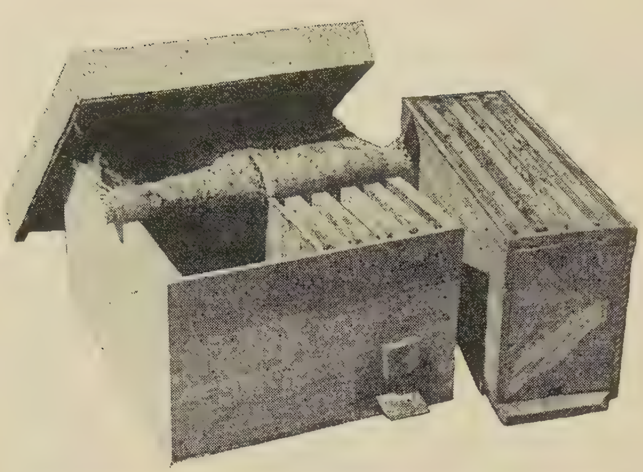
Care should be taken when these cells are being handled, as they are very easily damaged and chill fairly readily. Inside the cell the embryo queen is not yet completely developed and any squeezing or rough handling at this stage could cause permanent injury to her; nor should the cell be left exposed longer than is absolutely necessary when it is being transferred from one hive to another because of the risk of chilling, which would be fatal to the unborn queen.

Methods of Dividing

Once a strong hive has been selected division can be done in several ways. A simple method is to halve the brood and bees in the complete colony and place one of the divisions on a separate hive stand. A young queen or a cell is then given to the queenless portion of the division. Alternatively, four or five nucleus colonies each of four or five frames can be made. Each portion is given a queen cell or a young laying queen. Make sure that the portion containing the original queen is noted so that no cell or further young queen is introduced later.

If it is intended to make a much larger increase than one or two hives, the increase will have to be carried

A very strong colony suitable for division. Plenty of bees and brood are essential when dividing for increase.



← Suitable material for increasing the number of hives in an apiary is essential. Left—Super with centre division suitable for housing two nuclei. Right—Permanent 4-frame nucleus box.

out at the expense of the honey crop from the hive to be split up. If the colony to be used for making increase is strong in bees and contains about 10 frames of brood, it may be split up into 5 nuclei, allowing each 2 frames of brood and a frame of honey and pollen.

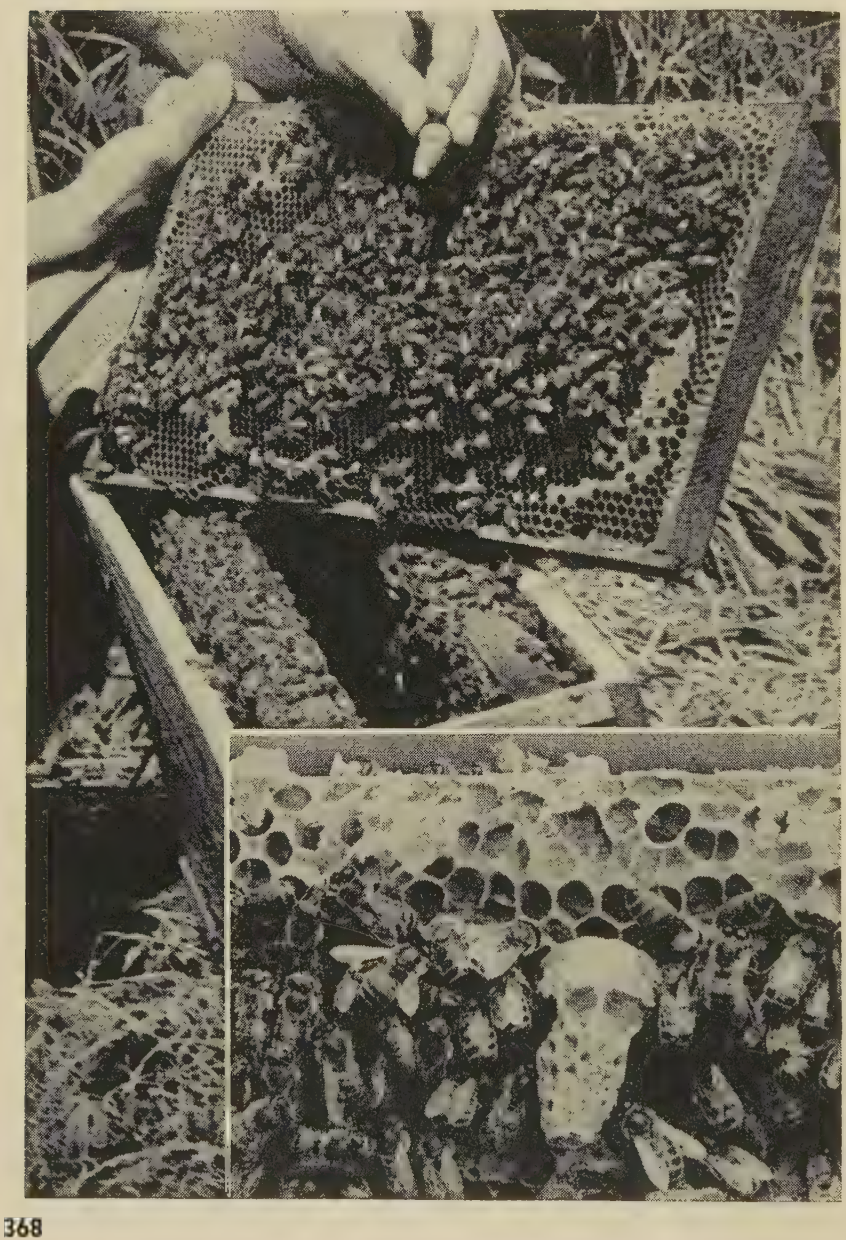
When the division has been made it is advisable to close the entrance with grass (not too tightly packed) to prevent most field bees from returning to the parent hive. When the grass withers in a day or so the bees will be able to make their way in and out.

Examining Hives

The increase should be examined a week or 10 days after the new queen has emerged from the cell (usually a young queen is born 15 or 16 days from the laying of the egg), by which time she should have started to lay.

When caged queens obtained from a queen breeder are used the beekeeper is recommended to look at the cage 2 or 3 days after its introduction to make sure that the queen has been satisfactorily released. At this stage it is not wise to look any further for her. The hive should be closed and the new queen allowed to settle down completely and start egg laying.

An examination of the brood nest can be made a week or 10 days after introduction of the queen to make sure that she has been accepted and has started to lay.



← Giving a nucleus hive a ripe queen cell. Inset—Ripe queen cell in position at top of a frame.

The use of nucleus hives is invaluable and even domestic beekeepers will find one or two helpful for building up backward colonies or uniting with a queenless colony when necessary.

Equipment for Making Increases

If only one or two hives are required, there is little use in securing a large amount of material; in fact, increase can be carried out with the standard super and bottom board. In this case a bottom board, super, mat, and hive lid will be needed for each additional hive required.

If several increases in the form of nuclei are desirable, a super fitted lengthwise with a division board through the centre will house two nuclei satisfactorily. The bottom of the super can be boarded up completely and two holes bored one in either end to provide entrances for the bees.

Proper nuclei hives to accommodate four frames can be constructed quite easily if nucleus colonies are to be maintained.

All photographs by Rendells.

◆

Production of Government-approved Tomato Seed

By D. W. McCALLUM,
Horticultural Instructor,
Department of Agriculture,
Blenheim

PRODUCTION of Government certified tomato seed in New Zealand began in a relatively small way immediately after the war when the benefits of using hydrochloric acid for seed extraction were being realised. To demonstrate that several seed-borne diseases could be controlled by this method Plant Diseases Division of the Department of Scientific and Industrial Research extracted the seed from Potentate tomatoes and made it available to commercial growers.

AFTER several years seed production was taken over by the Horticultural Research Station, Department of Agriculture, Levin, where the number of varieties from which seed was produced was increased to three, Potentate, Improved Bay State, and Moneymaker.

Multiplication Method Changed

Over the past 3 years the production and distribution of seed by Government Departments have been discussed by representatives of the Horticultural Seedsmen's Association, the Commercial Gardeners' Association (now the New Zealand Vegetable and Produce Growers' Federation), the Department of Scientific and Industrial Research, and the Department of Agriculture. Seed is not now multiplied by the Department of Agriculture but by members of the Horticultural Seedsmen's Association in Blenheim under the supervision of the Department's Horticultural Instructor.

During the 1957-58 season two varieties of tomatoes, Potentate and Improved Bay State, were grown under the approval scheme by the Horticultural Seedsmen's Association in Blenheim.

Nucleus Seed

Nucleus tomato seed is still produced by the Horticultural Research Station, Levin, and constant selection ensures that this seed is saved only from plants which measure up in every way to the high standard required.

Production of Seed

The seed firm producing seed on behalf of the Horticultural Seedsmen's Association tells the Department the name of the nurseryman who will be raising the plants and to whom seed is to be sent. The plants are supplied

Plants are inspected several times by the local Horticultural Instructor of the Department of Agriculture to ensure trueness to type and freedom from disease.

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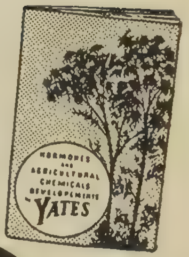

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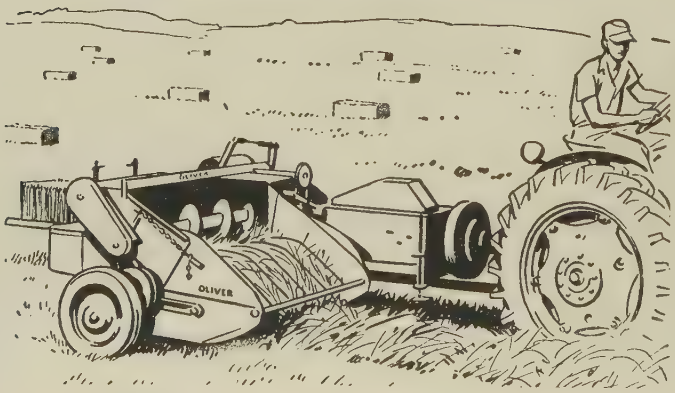

to the grower nominated by the seed firm when they are ready for setting out. Earliness of crop is not important and planting is delayed until well into November when the risk of damaging frosts is slight.

The plants are inspected several times in the seed boxes. The area where they are to be grown is inspected and approved, provided certain conditions are fulfilled, for example, no other tomatoes may be grown for seed on the same property and the seed crop must be isolated from other tomatoes whether of the same variety or not. The seed crop must not be grown on land which has grown tomatoes in the past 3 years and the crop must be staked or strung so that the characteristics of each plant can be studied and off-types rogued.

When the second truss of fruit is well formed a detailed inspection is made and all rogues and diseased plants removed. The Potentate crop grown in the 1957-58 season showed less than a quarter of 1 per cent of off-types. Improved Bay State was slightly more variable with just over 2 per cent of off-types. Most of the plants in both varieties referred to as off-types were, in fact, perfectly good plants producing sound fruit, but they varied slightly from what was regarded as a typical Potentate or typical Improved Bay State.

Further inspections are made as the plants develop and any diseased plants and plants which do not show the normal vigour of the variety are removed.

The grower and the instructor during one of the frequent inspections and discussions on progress of the seed crop.

The dried seed is sieved or winnowed to remove dust and small seeds.

Extraction of Seed

Fruit is harvested when it is red ripe, almost to the stage where it is softening. Extraction is simple, the pulp being squeezed into a wooden container and commercial grade hydrochloric acid being added, 1 fluid ounce of acid to 5 lb. of pulp. Under cooler conditions the amount of acid is increased slightly. The mixture is stirred periodically over about 2 hours and then the seed washed with water until it is free of skin and mucilage. The extracted seed is squeezed as dry as possible and spread thinly on muslin. When completely dry it is rubbed gently to free seeds sticking together and winnowed or sieved to remove dust and light seed.

Certification of Seed

The Horticultural Instructor draws a sample of seed from each batch of seed and seals the bags, which are then forwarded to the merchants. At this stage the seed is known as Government Approved. The merchants packet the seed in appropriate weights and each packet carries the following certificate:

> (Name of company or officer) certifies that this seed was packeted from a bulk supply of Government Approved .... tomato seed grown and harvested under the supervision of the Department of Agriculture and derived from seed originally selected at the Horticultural Research Station, Levin.

The cooperation between merchants, growers, and Departmental officers in the 1957-58 season has established that all are working toward a common goal, that is, the production of a first-class line of seed in which growers may have complete confidence.

Photographs by Kays.

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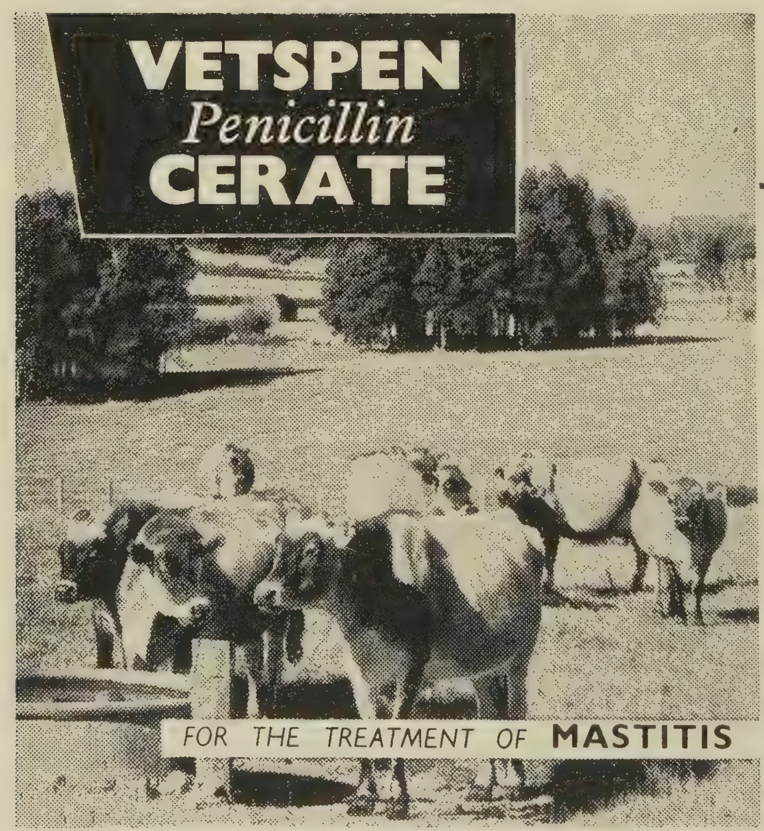
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Hormone Implants in Beef Production

THE conformation and functioning of an animal's body are controlled by complicated chemicals, called hormones, which are secreted by various glands. For example, apart from their direct effects on the reproductive systems, hormones produced in the testes not only cause male characteristics such as facial hair in humans but also promote the growth of muscle, while female hormones produced in the ovaries cause a widening and rounding of the pelvis and affect the distribution of body fat.

HORMONES—or rather their elimination—have long been made use of in agriculture, for when the testes of cattle and other meat animals are removed by castration the supply of male hormone ceases and there remains a more placid neuter which lays down more fat between and over its muscle to form the prime roasts which we like so well. The effects of caponising roosters are similar and a more fatty and succulent table bird is produced. The surgical operation, however, is more difficult, as the testes of a cockerel are inconveniently placed in the middle of the main body cavity.

Occasionally medical practitioners are confronted with cases of incorrect balance of sex hormones in the body, and the need for curative treatment led to the manufacture of chemicals which are very similar in composition to the natural hormones and which have the same effects when injected or fed. Two of the female sex hormones are called stilboestrol and hexoestrol, and one use which the latter has in agriculture is the subject of this paper.

When synthetic female sex hormones became available at moderate prices a method was evolved for using them to caponise roosters. The technique is simple. A small hard pellet of female hormone is placed under the skin of the neck, an instrument being used which is similar to a hypodermic syringe with a large needle. During the period of fattening the implanted pellet is slowly absorbed into the bloodstream, where it counteracts the effects of the natural male hormone and so produces a sexless bird. Similarly, hormone pellets implanted into the ears of bulls would have the same effect as castration, but in this case castration itself is not a particularly difficult operation.

The discovery that synthetic female hormones might be useful in beef production was made when they were given to animals which had already been castrated, and the results provoked widespread interest, particularly in North America and the United Kingdom. When implanted under the skin about 100 days before slaughter, or fed in a meal mixture throughout this period, the hormones have caused increases in rate of liveweight gain of 20 per cent or more. From a few pence outlay on hormone there have been returns of up to an extra 50 lb. carcass weight per animal, a most attractive possibility.

In the United Kingdom the synthetic hormone hexoestrol has been preferred to stilboestrol because of its lower potency to humans. It has been fed to steers at a rate of 10 milligrams (1/3,000 oz.) daily or implanted in the ear—which does not go directly for human consumption—at rates varying from single doses of 30 mg. (1/1,000 oz.) to 120 mg. Nowadays the lower rates are preferred for implantation, because there may be undesirable side effects if the dosage is too high. For example, with implantations of 120 mg. steers have become restless, mounted each other, developed rudimentary teats, and finally given carcasses which were proportionately heavier in the fore-end than in the hindquarters.

New Zealand Trial on Limited Scale

THE trial of hormone implants in beef production described in this paper by I. A. M. LUCAS, Rowett Research Institute, Scotland, given at this year's Farmers' Conference Week at Ruakura, involved only 11 treated steers. Mr Lucas, who at the time of the conference was working at Ruakura under a National Research Fellowship, said that the first results of the New Zealand trials had shown that the implants might be useful in beef production when there was ample food available and when it was desired to market the animals as quickly as possible, but it would be ridiculous to draw firm conclusions from such a limited trial.

Before a positive recommendation can be given it will be essential to obtain more information on dose rates, carcass quality, and the best way the implants can be used. Attention must also be paid to any dangers which may result from the use of a potent sex hormone.

Experiments with both cattle and sheep have shown that growth is increased only when there is no shortage of feed, but when there is extra growth it is achieved by an increase in the efficiency of conversion of feed into flesh. There is evidence that this is due to a diversion of nutrients from the wasteful process of fat deposition to the more efficient process of muscle and bone growth, and if this is true the carcasses from hormone treated animals should carry less fat, more lean meat, and slightly more bone than those which are not treated.

Until the spring of 1957 most overseas reports on hexoestrol and stilboestrol for steers described trials on animals stall-fed indoors. Before the hormones could be evaluated in relation to New Zealand conditions it was essential to test them on animals fattened solely on grass, and it was with this object that a pilot trial has been carried out at Ruakura. Here it was decided to test the effects of hexoestrol implants—hexoestrol because of its lower potency to humans and implantation because this is the only method of administering the hormone to animals fed no meal supplement.

Ruakura Experiment

Two lots of animals were used in the Ruakura experiment. Lot 1 contained 8 2-year-old Aberdeen Angus steers, all of which were in good condition. Lot 2 contained 14 5-year-old steers which had been used to control the grass on the Ruakura hill farm. There were in this lot 6 Aberdeen Angus, 4 Aberdeen Angus crosses, 2 Herefords, and 2 Hereford crosses, all of which were in lean condition.

Hexoestrol implants were given to 4 of the 2-year-olds on 26 September 1957 and to 7 of the 5-year-olds a week later. The dose rates were 60 mg. for the 2-year-olds and 90 mg. for the 5-year-olds. The hexoestrol was in the form of 15 mg. pellets, each of which is about the same shape as the head of a match, but somewhat smaller. The steers were restrained in a race and the required number of pellets were implanted under the skin about half-way along the tops of the left ears. This was done with the instrument manufactured commercially for implanting the pellets into roosters.

After being treated with hormone the steers ran with those which had not been treated, and both lots were used to control surplus grass on the fat-lamb areas during spring. At no time was there any shortage of feed, and no supplements of hay, silage, or concentrates were given.

It was observed that the rudimentary teats of the treated steers enlarged as the trial progressed, but there were no signs of the restlessness, mounting, and elevation of the tail head which have occurred when higher dose rates have been used. All animals remained in good health up to the time of slaughter.

All of the 2-year-olds were slaughtered 107 days after implantation,

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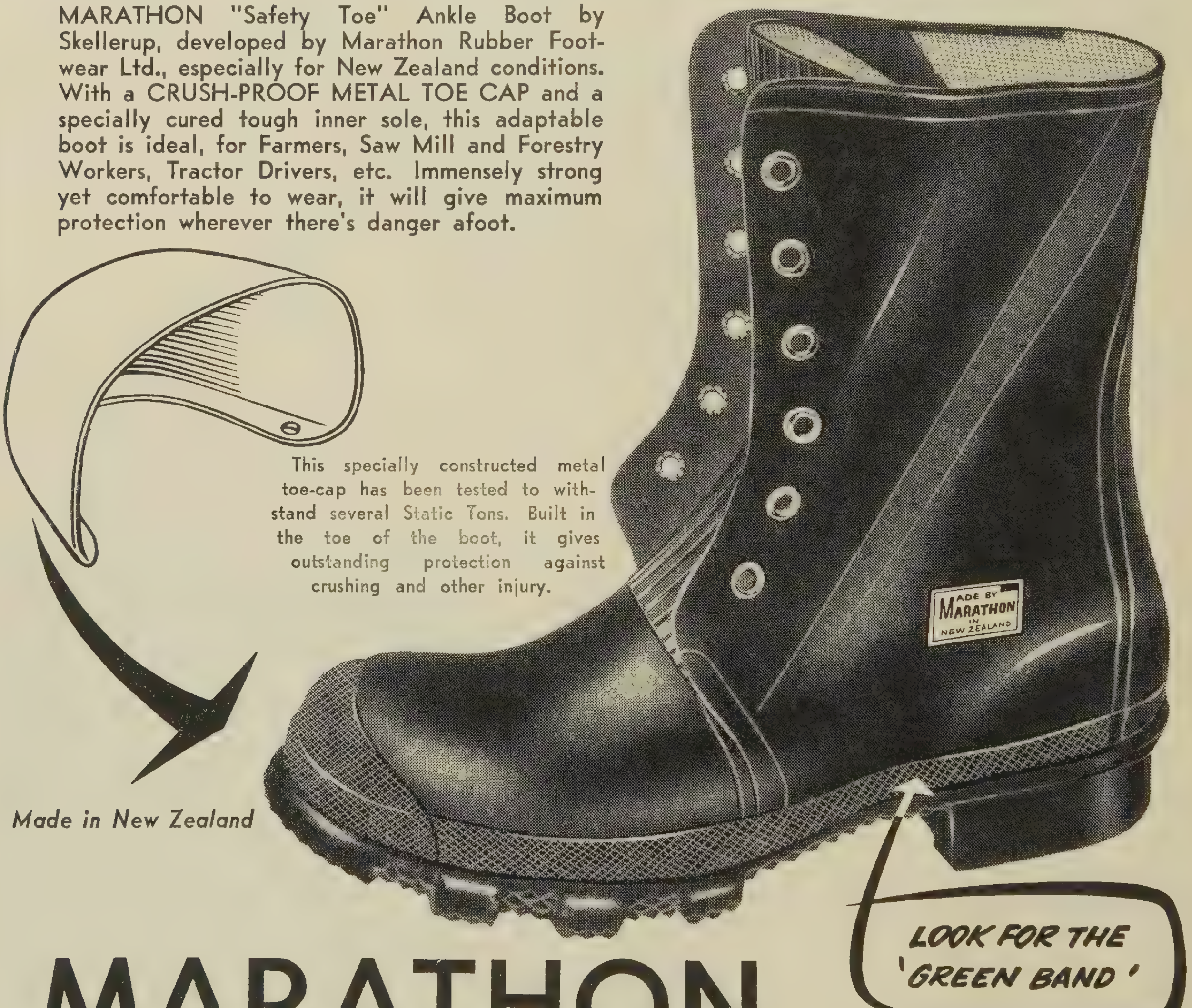

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while with the 5-year-olds an attempt was made to slaughter the two groups so that their final total liveweights would be about equal. Neither of these systems is very close to the method used on the farm, when steers are usually marketed when they are judged by eye to have reached a certain degree of "finish", but the use of this subjective method would be impracticable in deciding when to conclude an experiment when very small numbers of animals are used. Nevertheless, in the Ruakura trial visual assessments were made of the live animals before they were slaughtered, and for both age groups there was some indication that the hormone-treated steers were "finished" somewhat sooner than those which had not been treated.

Immediately after slaughter the residues of the hexoestrol pellets were cut out of the ears, dried, and weighed. From the weights implanted and the weights recovered it was calculated that the rate of absorption of hexoestrol from the pellet into the bloodstream had averaged 0.42 mg. daily for the 2-year-olds and 0.54 mg. daily for the 5-year-olds. These rates were equivalent to absorbing each day the weight of two small grains of sand, which illustrates the very small amount of hormone which was required to encourage faster growth.

In the fattening period Table 1 shows that the 2-year-olds averaged 950 lb. at the start of the trial and over the 107 days before slaughter the steers which had been implanted with hexoestrol put on 95 lb. more liveweight than those which had not been treated. This is an increase in rate of gain of 45 per cent.

TABLE 1—GROWTH OF 2-YEAR-OLDS

	Liveweight at start of trial (lb.)	Liveweight gain during 107 days (lb.)	Daily liveweight gain (lb.)
Hormone treated	949	307	2.87
Untreated ..	950	212	1.98

Of the 5-year-olds, one untreated and four treated steers were slaughtered at 74 days after the date of implantation, while six untreated and three treated steers remained to form a second draft after 107 days. On average, the treated steers were slaughtered 14 days sooner than the untreated, but despite this their final weight was the heavier by 17 lb. per animal. The overall effect with the 5-year-olds is best illustrated in Table 2 by the extra liveweight gain of almost 1 lb. per day due to hexoestrol treatment.

TABLE 2—GROWTH OF 5-YEAR-OLDS

	Liveweight at start of trial (lb.)	Liveweight at slaughter (lb.)	Days between start of trial and slaughter	Daily liveweight gain (lb.)
Hormone treated ..	1,208	1,586	88	4.3
Untreated	1,221	1,569	102	3.4

TABLE 4—CARCASS DATA FOR 5-YEAR-OLDS

	Dressing (per cent)	Carcass weight (lb.)	Weight hinds minus weight fores (lb.)	Thickness of eye muscle (mm.)	Thickness of fat over eye muscle (mm.)	Blockiness measurement (in.)	Carcass score (max. 100)
Hormone treated	54.6	866	+15	66	16	18.25	42
Untreated ..	53.7	842	+20	58	17	19.50	32

The response was clear cut in terms of greatly improved rate of liveweight increase, but this would be of little value if there was no parallel increase in carcass weight or if there was a deterioration in carcass quality. Therefore "freezing" carcass weights were recorded and the carcasses were judged by a system which has been used at Ruakura for some years. In it points are given for visual assessments of colour and texture of muscle and fat, marbling and rib cover, and for measurements of weight suitability, carcass balance, blockiness and thickness of fat, and depth of "eye" muscle on a cut taken between the tenth and eleventh ribs.

With both lots of steers the variability in dressing per cent was too large to allow any general conclusions to be reached, but in this trial lower dressing percentages in the treated 2-year-olds meant that their 95 lb. gain in liveweight gave only a 33 lb. gain in carcass.

In the 2-year-olds hexoestrol implants did not affect total carcass score, marbling, rib cover, and colour and texture of muscle and fat, nor were there changes in the measurement of thickness of eye muscle and blockiness. The hormone treatment did cause a reduction of about 9 lb. in weight of kidney fat and a decrease in the proportion of hindquarters in the carcass. However, about one half of this second effect was due to the first, for kidney fat is included in the weight of hindquarter (see Table 3).

In the 5-year-olds none of the characters judged by eye was affected by treatment, but there was an increase in carcass score which was mostly due to a greater thickness of eye muscle and a better measurement of blockiness. Weights of kidney fat were not recorded and no significance could be attached to a small difference in balance between fore-ends and hindquarters (see Table 4).

Discussion

Since this pilot trial was started at Ruakura a report has been published from Scotland of an experiment on hexoestrol implantation, 189 steers fattened solely on grass being used. There was no consistent advantage from increasing the dose above 30 mg.—half the Ruakura dose for 2-year-olds—and the overall effect of treatment was to improve liveweight gain by 0.54 lb. per day. Both this result and our own show that the effects of hexoestrol on steers fattened on grass are very similar to those for animals stall-fed indoors. We can be reasonably sure of the growth response provided the animals are well fed, and though there may sometimes be a decrease in dressing per cent, this is not large enough to detract from the substantial gains in carcass weight which may be obtained. However, there remains some doubt on the effect on carcass quality.

In some overseas trials high dose rates of 120 mg.—twice the Ruakura dose for 2-year-olds—have improved the ratio of muscle to fat, but in the Scottish trial doses of over 90 mg. caused undesirable "cowy" characteristics such as a darkness and "plainness" of the lean meat. At Ruakura the 90 mg. dose given to more mature steers than were used in Scotland improved the area of eye muscle and had no detrimental effect on flesh colour.

With the smaller doses of 30 mg. to 60 mg. hexoestrol in the Scottish experiment the colouring and marbling of meat were satisfactory, and in other British and American experiments "no change" has been reported in carcass quality. At Ruakura, however, there was a detrimental effect on the balance between forequarters and hindquarters, though other aspects of quality were not affected.

The information available suggests that when small doses of hexoestrol are used there are only small changes in the carcass qualities of 2-year-olds and there may be a beneficial effect in preventing the carcasses of older animals from becoming too fat. We

TABLE 3—CARCASS DATA FOR 2-YEAR-OLDS

	Dressing (per cent)	Carcass weight (lb.)	Weight hinds minus weight fores (lb.)	Weight of kidney fat (lb.)	Thickness of eye muscle (mm.)	Thickness of fat over eye muscle (mm.)	Blockiness measurement (in.)	Carcass score (max. 100)
Hormone treated ..	53.0	664	+3	8.9	62	13	16.50	52
Untreated	54.3	631	+20	17.5	59	11	16.75	50

HORMONE IMPLANTS . . .

know, however, that female sex hormones may affect the distribution of fat throughout the body, and the true extent of carcass changes may not be shown up by those measurements which are frequently used in assessing quality. Therefore it is desirable that complete carcass dissections, coupled with chemical analysis, should be carried out on a number of treated steers.

It would be ridiculous to draw firm conclusions on the usefulness of hexoestrol implants in New Zealand beef production from a trial involving only 11 treated steers. Our first results have shown that they may be useful when there is ample feed available and when it is desired to market the animals as quickly as possible. Before a positive recommendation can be given it will be essential to obtain more information on dose rates, on carcass quality, and on the best way in which hexoestrol implants can be made use of in the various systems of beef production. Attention must also be paid to any dangers which may result from the use of a potent sex hormone.

The first danger is to the treated animal, for though there have been no harmful effects of low dose rates on castrated males, implants of 35 mg. hexoestrol into heifers have resulted in both vaginal prolapse and sufficient udder growth to cause the carcasses to be graded as cows. Therefore the implants should be used only for steers.

After slaughter the meat of treated animals contains some hormone, but the amount of hormone present is so small that there is no question of the meat being harmful for human consumption. There may be residues of the pellets in the ears, but this site was chosen for implantation on the assumption that ears are not used as food. In this country they are removed from the skin of the carcass and some may be manufactured into gelatine, but tests in Australia have shown that the hormone is destroyed in the manufacturing process. It cannot be over-emphasised that implantation of the hormone into other parts of the body which might be used directly as human or animal food could have serious consequences.

Another danger which has recently been noted in the British agricultural press is that the hormones may pass intact through the treated animals and accumulate in the topsoil to the danger of future grazing stock. This possibility, which has yet to be proved, is presumably of greatest importance when cattle or sheep are fed hormones in a meal mixture, but the report was brief and more information on this must be obtained.

Finally, hexoestrol pellets awaiting use must be treated as a most dangerous drug. It should be remembered that an amount as small as only two grains of sand is sufficient to have a startling effect on the growth of a 10 cwt. steer.

Radio Broadcasts for Farmers during November

RADIO broadcasts for farmers will be given during November as follows:

1YA Auckland, 7.45 p.m.

5 and 19 November—Talks by officers of the Animal Industry Division, Department of Agriculture, Auckland.

12 November—"Summer Pasture Management", by G. L. Banfield, Instructor in Agriculture, Department of Agriculture, Thames.

26 November—"Haymaking", by H. McM. Bull, Instructor in Agriculture, Department of Agriculture, Auckland.

1XH Hamilton, 12.33 p.m.

10 November—"Early Weaning of Lambs", by L. P. Wells, Livestock Instructor, Department of Agriculture, Hamilton.

17 November—"Gorse Eradication", by J. D. Currie, Instructor in Agriculture, Department of Agriculture, Hamilton.

24 November—"Eastern Markets for Dairy Produce", by I. McKinnon, Federated Farmers, Hamilton.

1YZ Rotorua, 7.15 p.m.

12 November—"Care and Treatment of the Farm Dog", by Livestock Instructor, Department of Agriculture, Rotorua.

26 November—"Cooling of Milk and Cream", by M. J. McFetridge, Supervisor of Farm Dairy Instruction, Department of Agriculture, Hamilton.

2XG Gisborne, 8 p.m.

11 November—"For the Poverty Bay Orchardist", by J. D. Overbye, Horticultural Instructor, Department of Agriculture, Gisborne.

2YZ Napier, 7.10 p.m.

4 November—"Farm Water Storage", by J. L. Porter, Soil Conservator, Department of Agriculture, Hastings.

18 November—"Lucerne", by A. J. Coughlan, Fields Instructor, Department of Agriculture, Hastings.

2XA Wanganui, 8 p.m.

6 November—"For the Country Woman", by Mary MacDonald.

13 November—"The Radio Vet.", by S. Jamieson, Veterinarian, Department of Agriculture, Wanganui.

20 November—Talk by C. M. Bailey, Supervisor, Taranaki District Pig Council.

27 November—"Control of Stored Product Pests", by T. N. Flint, Plant Quarantine Officer, Department of Agriculture, Palmerston North.

2ZA Palmerston North, 12.33 p.m.

10 November—"Wool Handling", by H. L. Turner, Sheep and Wool Instructor, Department of Agriculture, Feilding.

17 November—"Make ready for Irrigation", by J. O. Brasell, Farm Machinery Instructor, Department of Agriculture, Palmerston North.

24 November—"Weed Control in Horticultural Crops", by G. N. Paulin, Horticultural Instructor, Department of Agriculture, Palmerston North.

3YA Christchurch, 12.20 p.m.

3 November—"Planning the Vegetable Garden for Winter Supply", by L. C. Hurndell, Horticultural Instructor, Department of Agriculture, Christchurch.

17 November—Review of "The New Zealand Journal of Agriculture", by E. G. Smith, Instructor in Agriculture, Department of Agriculture, Rangiora.

4YA Dunedin and 4YZ Invercargill, 12.33 p.m.

3 November—"Internal Parasites", by C. E. Isaacs, Veterinarian, Department of Agriculture, Invercargill.

10 November—"1958 Grasslands Conference", by A. G. Elliott, Fields Superintendent, Department of Agriculture, Dunedin.

17 November—"Fertilising Clover Seed", by D. W. A. Seal, Apiary Instructor, Department of Agriculture, Invercargill.

24 November—"The Benefits of Early Weaning", by I. M. Cairney, Veterinarian, Department of Agriculture, Dunedin.

Regular Sessions

1XH Hamilton, Mondays at 12.33 p.m. and Tuesdays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (stock sale review).

1XN Whangarei, Mondays at 8 p.m. (Northland livestock report and "Farming for Profit"), Wednesdays at 8 p.m. ("Farming for Profit"), and Fridays at 8 p.m.

1YA Auckland, Mondays at 12.33 p.m., Tuesdays, Wednesdays, and Thursdays at 7.45 p.m., and Fridays at 6 p.m. and 7.45 p.m.

1YZ Rotorua, Mondays at 12.33 p.m. (Waikato stock market review), Tuesdays at 7 p.m. (Hamilton stock market report), Wednesdays at 7.15 p.m., Thursdays at 12.33 p.m.

2XA Wanganui, Wednesdays at 8 p.m. (stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m., Fridays at 8.2 p.m. (Gisborne stock market report).

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8.1 p.m.

2YA Wellington, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m. (Feilding stock market report).

2YZ Napier, Tuesdays at 12.12 p.m. (Hawke's Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawke's Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

3XC Timaru, Mondays at 8 p.m. (Pleasant Point stock market report), Tuesdays (fortnighty) at 8 p.m. (Temuka stock market report), Wednesdays at 8 p.m., and Saturdays at 10.30 a.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

3YZ Greymouth, Mondays and Thursdays at 12.33 p.m.

4YA Dunedin, Mondays at 12.33 p.m., Tuesdays at 12.33 p.m., Wednesdays at 12.33 p.m. and 6.50 p.m. (Burnside stock market report), Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.33 p.m., Tuesdays at 12.33 p.m. and 7.15 p.m. (Lorneville and Gore stock market reports), Wednesdays at 12.33 p.m., Thursdays at 12.33 p.m.

Hormone Implants in Wool Production

By D. A. ROSS,
Wool Research Officer, The New Zealand Wool Industries Research Institute, Dunedin

THE part which hormones play in milk production and release and their relation to fertility problems in sheep and cows have been discussed at many farming conferences. Considerable research has also been directed toward discovering the effect of hormones in meat production, some aspects of which are discussed in another article in this issue. Only recently have any but sporadic attempts been made to determine the part played by hormones in wool production and to see if they have a place in economic farming. Some hormones such as crude pituitary extract and ox growth hormone stimulate wool growth, while others such as cortisone depress it. The possibility of stimulating wool production on a commercial scale with another hormone called thyroxine has had wide publicity in New Zealand, and the results of investigations which have been carried out with this hormone are reported in this paper given at this year's Ruakura Farmers' Conference Week. Considerably more detailed research is required before a full picture of the effects of thyroxine implants on sheep are known, and at present their general use by farmers cannot be recommended.

WHAT is thyroxine? It is the hormone secreted into the bloodstream by the thyroid gland and being a relatively simple chemical compound it can be synthesised in the laboratory. As a general metabolic hormone it does not have one specific action, but affects the body as a whole. Thus while considering its effect on wool growth, its action on other body functions such as reproduction, lactation, and general fitness must also be taken into account.

Research on the use of thyroxine for increasing wool production has largely been carried out by D. S. Hart, of Lincoln College. Mr Hart (1957) found increases of up to 15 per cent in the greasy fleece weights of mixed-aged Romney ewes which were implanted under the skin with 60 mg. of thyroxine. The increases in fleece weight varied considerably between trials, and Romney ewes responded better than Corriedales. K. A. Ferguson (1958) found increases in wool production of up to 25 per cent in

HEADING PHOTOGRAPH: Demonstration of thyroxine implantation to a farmers' conference by D. S. Hart, Canterbury Agricultural College, during a field day at the College's Ashley Dene property in 1956.

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Merino ewes treated with tri-weekly injections of thyroxine. However, a number of deaths occurred in the ewes on higher dose levels. Thyroxine implants of 90 mg. appear to be quite safe for Romney ewes and it seems unlikely that they affect the longevity of the sheep.

The time of implanting the thyroxine pellets would seem to be crucial. Winter-spring implantations do not appear to increase wool production and Mr Hart recommends late summer-early autumn implantations, about 2 to 3 weeks before the rams are put out.

Experimental

The results reported in this paper are from two trials carried out by the New Zealand Wool Industries Research Institute in collaboration with K. H. C. Lewis, Department of Agriculture's Research Station, Invermay (Messrs Ross and Lewis 1958), which is situated at the head of the Taieri Plains about 10 miles west of Dunedin, and one trial (C) on a fat lamb farm in South Canterbury.

The sheep used in the three trials were Romney crossbred ewes.

Trial A: This trial was designed to provide a lifetime study of the effect of annual thyroxine implantations on wool growth and productivity of Romney ewes. A line of 206 2-tooth ewes selected for relatively uniform wool type was divided into two groups on a weight basis. One group of 103 ewes was implanted with 90 mg. of thyroxine in March 1956. As 4-tooths the same ewes were implanted with 60 mg. in March 1957 and again as 6-tooths with 90 mg. in March 1958. Wool samples at 4-monthly intervals have been taken throughout this trial.

Trial B: Ten full-mouth ewes were implanted with 60 mg. of thyroxine in March 1957 and again with 90 mg. in the following November.

Trial C: In this trial 44 mixed-aged ewes were implanted with 60 mg. of thyroxine in early April 1957.

In each trial a similar number of ewes to those treated with thyroxine were run as controls.

Wool Production

The full-year fleece weights, less bellies and board locks, of these trials, and the increase or decrease of the thyroxine treated mob compared with the controls are given in Table 1.

TABLE 1—FLEECE WEIGHTS

Trial	Control (lb.)	Thyroxine treated (lb.)	Difference per cent
A. 2-tooths ..	9.68	10.03	+3.6
A. 4-tooths ..	9.80	9.86	+0.6
B. Full-mouth ..	9.23	9.24	+0.1
C. Mixed-aged ..	9.41	9.23	—1.9

As shown in Table 1 there was little increase in wool growth except with the 2-tooth ewes, where the increase was statistically significant. There were, however, more barren ewes and less twins in the 2-tooth treated group and the fleece weights of single bearing ewes were almost identical, being 9.81 lb. and 9.83 lb. for the control and treated groups respectively.

With such small increases in fleece weights it is not surprising that no differences were found in count number, style grading, or the number of cotted fleeces between the two groups. Mr Hart (1957) found that thyroxine treatment improved the style grading of the wool, which would result in a better price at auction.

Some other interesting facts about the effects of thyroxine on wool growth arose from examination of the 4-monthly samples. An increase of 12 per cent in greasy wool production was found for the 4 months immediately following thyroxine implantation in the 2-tooths. As the wool grown in this 4-month period represented only 30 per cent of the total year's production and as there was no increase during the rest of the year, the 12 per cent increase as a proportion of the full year's growth was only 3.6 per cent.

The extra wool produced during this 4-month period resulted in a 13 per cent increase in staple length and a very slight reduction in diameter. Another interesting observation, as shown in Table 2, was that in the 2-tooths the degree of lambing break was considerably reduced, the thyroxine treated staples being 20 per cent stronger. No differences in lambing break, however, were found in the 4-tooth and mixed-aged mobs. Messrs Barton and Kirton (1958) found bad wool breaks 28 days after implanting very large doses of thyroxine.

TABLE 2—STAPLE STRENGTH

Breaking Load lb./g. (2½ in. Breaking Length)

Trial	Control	Treated	Difference per cent
A. 2-tooths ..	51.4	61.7	+20*
A. 4-tooths ..	41.4	42.2	+2†
B. Full-mouth ..	26.7	34.3	+28†
C. Mixed-aged ..	83.0	81.8	—1†

* Significant at the 1 per cent level.
† Not significant at the 5 per cent level.

While no manufacturing trials have so far been carried out, the results to date indicate that wool from thyroxine treated sheep would process as well if not better than that from the control group. The extra staple length and the increased staple strength should result in less fibre breakage during carding and combing, with a consequent decrease in noil production and an increase in yarn strength. The small decrease in fibre diameter which occurred at a time when diameter is near its seasonal maximum is no disadvantage, while recent work has shown that increased crimp found in the treated wool is a highly desirable feature from considerations of both processing and the final cloth.

Body-weight Changes Following Thyroxine Implantation

The implantation of thyroxine may result in a loss of body-weight, as the animal burns up the feed it eats at a greater rate. This loss in body-weight is found even though the sheep increases its food intake (Mr Ferguson).

Table 3 shows the body-weight changes following implantation for the Trial A ewes in 3 successive years.

TABLE 3—WEIGHT CHANGES FOLLOWING THYROXINE IMPLANTATION

Trial	Weight at implantation (lb.)	Loss after treatment (lb.)	Change after 20 days (lb.)
2-tooths ..	97	4	—1
4-tooths ..	122	0	+8
6-tooths ..	147	0	+12

In only the 2-tooths, which were on poor feed, was there any body-weight loss after implantation.

Within 20 days of implanting 90 mg. of thyroxine into the heavy 6-tooth ewes they had increased to an average weight of 159 lb. The liveweight change following thyroxine implantation will depend on the condition of the ewes and the feed available at implantation, but as shown by these results the implants will not always take weight off fat ewes.

Fertility

It is important from economic considerations that thyroxine implantation should not decrease the fertility of the ewe. Mr Hart (1958) reports increases in the number of eggs shed and in the number of lambs dropped in several different trials where the ewes were implanted 2 weeks before putting the rams out.

It has been suggested that autumn implantations of thyroxine which result in a body-weight change may act as a type of artificial flushing, though in normal practice flushing responses are associated with increases in body-weight.

Table 4 gives the lambing performance of the ewes in Trial A as 2- and 4-tooths.

TABLE 4—LAMBING PERFORMANCE

	2-tooths		4-tooths	
	Control	Treated	Control	Treated
Ewes mated ..	103	103	98	98
Lambs born ..	108	88	129	122
Barren ewes ..	5	18	5	8
Ewes with twins or triplets ..	17	10	37	31

The thyroxine implantation in the 2-tooths resulted in a marked decrease in fertility. This was due to a large increase in the number of barren ewes and to a reduction in the number of twins in the treated group. The treated ewes on the average dropped their lambs 8 days later than the control ewes, while twin-bearing treated ewes dropped their lambs 25 days later than the twin-bearing ewes in the control group. The treatment has thus reduced the chances of conceiving twins in the first few weeks of mating.

As 4-tooths there was little difference between the groups, though again there were more barren ewes and fewer twins in the treated group. Both groups lambed at the same time. It may be that the breeding cycle of 2-tooth ewes is more easily upset by thyroxine implantations than that of mature ewes. However, the 2-tooth ewes were the only ones which gave a reasonable wool production response.

Lactation

While thyroxine administration can stimulate lactation, it is unlikely that implants made before mating will affect the growth-rate of lambs born 6 months later. Table 5 shows the growth-rate of single lambs from the 2-tooth ewes, from birth to weaning, and the growth-rate of single and twin lambs from the 4-tooth ewes from birth to the time of the first draft.

TABLE 5—LAMB GROWTH-RATES
(lb. per day)

Trial	Control	Treated
2-tooths		
Singles	0.433	0.428
4-tooths		
Singles	0.552	0.569
Twins	0.487	0.475

It is obvious from Table 5 that the treatment has not affected the growth-rate of either the single or the twin lambs. Growth-rate, particularly of twin lambs, is a good measure of the milk production of the ewe. The thyroxine implants therefore did not increase milk production.

Discussion

It is apparent that very variable responses have been found from thyroxine implantations.

While prediction of wool prices and of the weather have much in common, it is probable that an increase of at least ½ lb. of wool per head would be necessary to cover the cost of the thyroxine implantation. There is very little time or labour involved in implanting ewes.

We have found increases of 66 per cent in the heart rate of Romney ewes 5 weeks after thyroxine implantation. This figure is comparable with 90 per cent found in Merinos by Mr Ferguson (1958). This indicates an increase in metabolic rate of the treated sheep, which, as shown by Mr Ferguson, results in a decreased net efficiency of wool production, so that more feed is required to grow a unit of wool in thyroxine treated sheep than in untreated sheep.

The economics of the utilisation of excess autumn flush pasture by using thyroxine as opposed to saving it for the winter-spring period have not as yet been determined. Once wool has grown, however, it cannot be lost and has an immediate economic value. The state of the ewes, whether lean or fat, and the probable winter feed supply will all affect the decision to implant and the response.

In some districts it is not safe to start implanting until the possibility of a facial eczema outbreak is past. Mr Hart (1957) found that ewes shut up for facial eczema control lost 18 lb. liveweight after thyroxine implantation. Under such circumstances the ewes might be very adversely affected.

More data are required on the time of implanting in relation to mating. As 40 to 50 per cent of the annual wool production is grown in summer, a larger wool response might be found from implantations in early or mid-summer, when seasonal wool growth is approaching its maximum. In this case the effects of the implants should be reduced by tupping time, thus avoiding any possible adverse effects on fertility.

It is possible that some of the variation in the responses from thyroxine are due to differences in the structure of the thyroxine pellets. This would affect the rate at which the pellets are absorbed by the bloodstream.

Conclusions

It can be seen from the results given in this paper that the wool response of ewes to thyroxine implantations are very variable. Similarly, the effects of implantation on other body processes such as fertility and body-weight changes are by no means clear. Considerably more detailed research is required before a full picture of the effects of thyroxine implants on sheep are known and the economics of its use in the sheep farming industry in New Zealand can be assessed. With our present state of knowledge the general use of this hormone by farmers cannot be recommended.

Acknowledgments

The author is indebted to Mr D. S. Hart, Canterbury Agricultural College, for implanting the ewes and for guidance with the trials, and to Glaxo Laboratories (N.Z.) Ltd. for the supply of thyroxine pellets used in these experiments.

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N.Z. Grassland Association Conference

MANY aspects of pasture improvement will be discussed at the twentieth conference of the New Zealand Grassland Association to be held at Dunedin from 11 to 14 November.

Pasture production, soil fertility, and problem soils in Otago receive special attention in the programme, but many papers will have a wider application. The latest methods of improving pasture in low altitude snow tussock country will be discussed and pasture development work at the Invermay Research Station will be reviewed. The programme is as follows:

11 November: Opening address by the president, Dr L. Corkill, Crop Research Division, Department of Scientific and Industrial Research, Christchurch.

12 November: "Farming in Otago", A. G. Elliott, Department of Agriculture, Dunedin; "Soils of Otago—their Problems and Potential", J. D. Raeside, Soil Bureau, Department of Scientific and Industrial Research, Dunedin; "Pastures and Soil Fertility", Dr P. D. Sears, Grasslands Division, Department of Scientific and Industrial Research, Palmerston North; "The Improvement of Foothill Country", W. R. Lobb, Department of Agriculture, Christchurch; "Pasture Improvement at Invermay", G. A. Holmes, Invermay Research Station; "Pasture Improvement in Low Altitude Snow Tussock and Scrubland", H. A. Duff, Department of Agriculture, Dunedin; "Farm Shelter for Exposed Rolling Country of Otago", C. H. Brown, New Zealand Forest Service; "Economics of Land Development in Otago", N. M. Peryman, land valuer, Dunedin.

13 November: In the morning there will be a field trip to three Otago farms to see examples of development work. This will be followed by a visit in the afternoon to Invermay Research Station. The annual meeting of the association and a social will be held in the evening.

14 November: "Methods of Manufacture and Control of Legume Inoculants Prepared in New Zealand", J. R. Callaghan, Biological Laboratories Ltd., Auckland; "Effect of Management on Pasture Composition", Miss S. M. Maclean, Department of Agriculture, Wellington; "Pasture Establishment Studies at Invermay Research Station", N. A. Cullen, Invermay Research Station.

PASTRY

By PATRICIA M. BAWDEN,

formerly Home Science Instructor, Department of Agriculture,
Palmerston North

PASTRY has a wide variety of uses, and one of its main advantages is that it may be prepared and stored for use at very short notice. Cases or flans of both cooked or uncooked pastry may be wrapped in foil and stored away for an emergency, when with a little imagination the housewife can very quickly serve an appetising meal. Important points in the making and using of each of the main types of pastry are described here with a number of recipes.

GOOD pastry, irrespective of type, is tender and flaky, has a blistery surface, and is golden brown when cooked. It is easy to cut with a fork, but does not crumble.

Important Points

Points to watch in the preparation and making of good pastry are:

1. Have all utensils and ingredients at hand before beginning to make pastry.

2. Correct proportions are essential and the cook must be very accurate when weighing or measuring. Too much flour makes pastry hard and tough, too much fat makes it dry and crumbly, and too much liquid makes it heavy and soggy.

3. Avoid overhandling or overmixing, as this too will tend to make the pastry tough. If small pieces of fat remain in the dough after rolling and cutting, they will melt when the pastry is baked and make it much more light and flaky.

4. Make the pastry in the coolest part of the kitchen. Use materials which are as cold as possible—ice water is excellent—and if time permits, chill the pastry after final rolling before use.

5. Cut the fat into the flour, using two knives, until the mixture resembles coarse breadcrumbs.

6. For mixing use a knife and add only sufficient liquid to make the ingredients just stick together when pressed lightly with the fingers.

HEADING PHOTOGRAPH: Sausage rolls are made with puff pastry, which is also used for patty cases, pastry pinwheels, and pastry squares.

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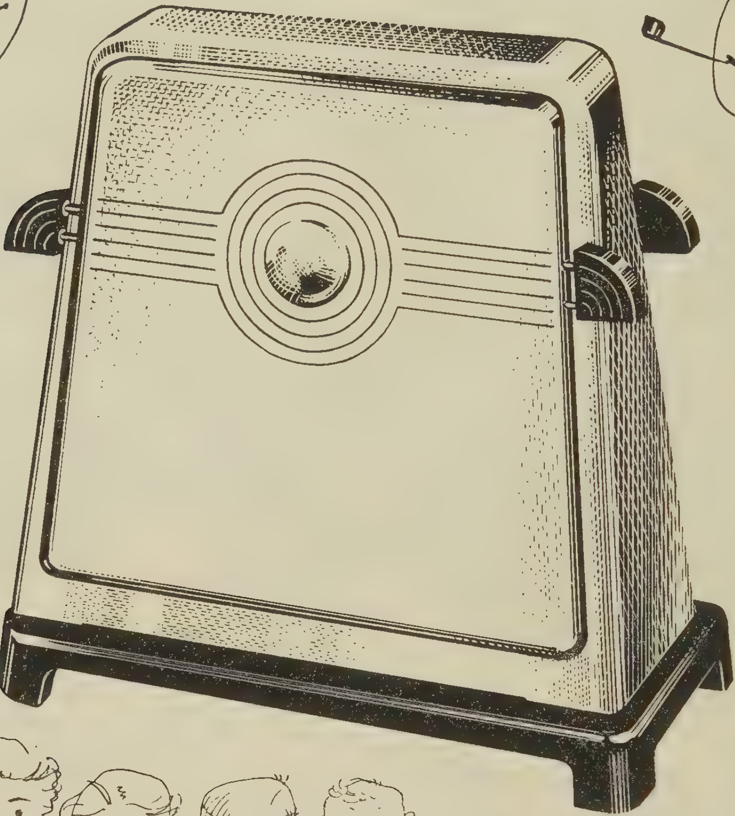

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7. Uncooked pastry may be stored for up to 1 week if wrapped in greaseproof paper or foil and chilled.

8. Dredge the pastry board and rolling pin only lightly with flour, as too much will cause a hard outer layer.

9. Always roll pastry away from you—not backward and forward. Roll firmly and lightly, keep the pressure even, and do not roll off the pastry, as this spoils the edges.

10. If possible, never lift pastry by the edges, as the middle may stretch and tear. Fold in half or roll across the rolling pin and lift over the dish.

Cooking

Before it is baked, pastry should be glazed to make it look attractive. The glaze should be applied with a pastry brush. For sweet or savoury dishes brush the pastry with beaten egg or beaten egg whites. A variation to this is to sprinkle sugar or chopped almonds over the egg white. For a quick glaze brush the pastry with milk.

Pastry should be baked in a hot oven. If the oven is too cool, the pastry will not rise quickly enough and will remain flat and soggy. For short pastry the temperature should be 400 degrees F., for flaky pastry 450 degrees F., and for puff pastry 500 degrees F. The pastry should be firm, dry, and golden brown when cooked. For filled pastry lower the heat after 10 minutes and continue cooking until sure that the filling is thoroughly cooked.

Ingredients

The basic ingredients of pastry are flour, fat, salt, and water.

Flour: Wholemeal or white flour may be used. Wholemeal pastry is not as light and tender as that made with white flour, but it does make a tasty change.

Fat: Lard alone is probably the best, though a combination of lard and butter also gives very good results. Clarified dripping may be used, but when alone tends to make a soft pastry, and mutton fat and vegetable fat both make rather hard pastry. However, either mutton fat and vegetable fat are quite successful if combined with butter Butter is most commonly used.

Water: Pastry may be made with hot water. The fat may sometimes be melted in the hot liquid and stirred into the flour. However, as this tends to make a crumbly pastry, it is more usual to use cold water. A squeeze of lemon juice added to ice water is perhaps the best. The proportion of water used for pastry is usually $\frac{1}{4}$ cup to 1 cup of flour.

Salt should be added to all pastry to season it. Allow more for meat pies or savoury dishes.

SHORT PASTRY AND FLAKY PASTRY

[*Sparrow*

Making short pastry. Sprinkle cold water in small quantities over the fat-flour crumbs.

▼ To make flaky pastry the fat is dotted on the dough.

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A two-crust pie and a jam tart made from short pastry.

Varieties of Pastry

There are three main kinds of pastry, plain or short pastry, puff pastry, and flaky pastry, the type depending on the proportion of fat used and the method of adding it.

Proportions and methods are:

Short pastry, 2 oz. of fat to 4 oz. of flour, the fat being cut into the dry ingredients; flaky pastry, 3 oz. of fat to 4 oz. of flour, the fat being added by a combination of two methods; puff pastry, 4 oz. of fat to 4 oz. of flour, the fat being rolled and folded into the mixed dough.

Recipes

Recipes for making these three varieties of pastry are given here.

Short Pastry

4 oz. of flour
2 oz. of fat
¼ teaspoon of salt

Cut the fat into the flour and salt until the mixture is like coarse breadcrumbs. Gradually add sufficient cold water to make a stiff dough and mix with a knife. Roll out on a lightly floured board.

This quantity makes one shell. For a two-crust pie (7 in. dish) increase all ingredients by half. Bake at 400 degrees F. for 10 to 15 minutes.

Flaky Pastry

4 oz. of flour
3 oz. of fat
¼ teaspoon of salt

Divide the fat into four portions. Cut one portion into the sifted flour and salt until the mixture is like coarse breadcrumbs. Add cold water to make a stiff dough. Gather the dough together lightly with the finger tips. Roll it out into an oblong strip and dot the next portion of the fat in small lumps over two-thirds of the length of pastry. Fold up the other third of the pastry, lifting high to enclose air. Then fold the remaining third down on top of this so that the fat is covered. Seal all the edges of the pastry with light pressure of the rolling pin. Give the pastry a half turn to the left. Press gently with the rolling pin to enclose air. Roll out again, using small flicking movements, as heavy rolling will break any air bubbles. Repeat the rolling and folding until all the fat has been used. Bake at 450 degrees F. for 10 minutes.

Puff Pastry

4 oz. of fat
(preferably butter)
4 oz. of flour
¼ teaspoon of salt

Place the butter in a piece of muslin and work it in water until soft and pliable. Loosen the butter from the muslin and cut it into a square. Mix the flour and salt with water into a dough of the same stiffness as the butter. Roll it into an oblong ¼ in. thick, put a pat of butter on to half the oblong, and fold the other half over it. Turn the dough and roll it out. Fold in three, envelope style, and turn the pastry again. Roll, fold, and turn six times. Cut with a sharp knife or cutter. Bake on ungreased trays at 500 degrees F. for 8 to 10 minutes well down in the oven.

RECIPES MADE WITH DIFFERENT PASTRIES

Christmas mince pies may be made from flaky pastry, which is not as rich as puff pastry.

Suggestions for Use

Short Pastry

Short pastry is used for tarts, two-crust pies, baked dumplings, pasties, shells, and flans.

Fruit Flans

Roll short pastry ⅛ to ¼ in. thick into a circle 2 in. wider than a flan ring. Place a buttered flan ring on a greased baking tray and ease the pastry into the ring, taking care not to stretch it. Press carefully to fit the bottom and sides and remove air bubbles. Roll across the top of the ring with the rolling pin to press away any overlapping pastry. The edge may be left plain or pinch with the fingers to form a fluting. Prick well and bake.

A great variety of flans may be made with raw, frozen, tinned, or cooked fruit. The fruit is attractively arranged in the cooked case and then glazed.

Glazes for flans: The simplest glaze for uncooked fruits is apricot glaze made with 2 tablespoons of sieved apricot jam to 2 tablespoons of water. Bring this mixture to the boil, stirring constantly. Cool slightly before using. Use just sufficient to hold the fruit in place. (The juice of the fruit may be thickened and used as a glaze.) Set with arrowroot or gelatine.

For arrowroot setting allow a fraction over ½ teaspoon of arrowroot to ¼ pint of sweetened fruit juice. Bottled, tinned, or cooked fruit juice may be used. Cream the arrowroot with a little of the juice and bring the remainder of the juice to the boil. Remove from the heat and sweeten to taste. Stir into the arrowroot. When blended return to the saucepan and cook for 3 minutes, stirring constantly. Cool slightly before pouring over the arranged fruit.

If jelly setting is used, add 1 teaspoon of powdered gelatine to ¼ pint of juice. Soak for 5 minutes. Stir over hot water until the gelatine is dissolved, and then sweeten to taste. When the sugar is dissolved remove from over the water and stir in any remaining juice. When cool and about to set pour over the fruit.

Mandarin or Orange Flan

Arrange slices of fruit in a wheel. Glaze with arrowroot setting made with the juice.

Apple Flan

Peel and slice apple thinly and evenly and arrange overlapping in the case. For this an uncooked pastry base may be used. Sprinkle with castor sugar and lemon juice. Bake in a moderate oven for about 25 minutes. Decorate with whipped cream and cherries or nuts.

Coconut Cream Pie

1 pint of milk
5 oz. of sugar
1 oz. of cornflour
4 eggs
1 teaspoon of vanilla
¼ teaspoon of salt
1 cup of coconut

Soak the coconut in a little water or milk for ½ hour. Mix the cornflour with the salt, half the sugar, and a little cold milk. Scald the remainder of the milk and pour into the cornflour mixture. Cook for 5 minutes. Add the well-beaten egg yolks and cook over hot water, stirring constantly. Cool the mixture and then fold into the stiffly beaten egg whites, beaten with the remainder of the sugar, as when making meringues. Fold in the soaked coconut and vanilla. Pile into the already cooked pie shells. Swirl over the top, taking care that the filling comes to the edge of the case. Dredge lightly with castor sugar. Bake in a moderate oven at 350 degrees F. for about 10 minutes until tinged with a gold colour.

Flaky Pastry

Flaky pastry is used for meat pie crusts, sausage rolls, and pastry squares and may also be used for pastry pin wheels. Here is a suggestion for a tasty tea or picnic pie:

Liver and Bacon Pie

Filling

2 or 3 rashers of bacon
½ lb. of liver
Salt and pepper to taste
1 small onion
Pinch of crushed dried sage
1 teaspoon of tomato chutney

Pastry

8 oz. of flour
6 oz. of fat
½ cup of water
¼ teaspoon of salt

Make pastry as for flaky pastry method. Leave aside to cool while preparing filling.

Lightly fry the bacon in a hot pan until the fat runs freely. Drain the bacon and chop. Fry the liver and onion in the fat left in the pan. Cook the onion until soft, but remove the liver when par-cooked. Chop these ingredients small and add pepper and salt to taste. Add the sage and tomato chutney. Fill the prepared, uncooked case. Cover the filling with the remainder of the pastry, sealing the edges firmly. Make several slits radiating from the centre and place a small star cut out of pastry in the middle. Bake at 400 degrees F. for 20 to 25 minutes.

Puff Pastry

Puff pastry is used mainly for patty cases, sausage rolls, pastry pinwheels and pastry squares.

Pastry Pinwheels

Pastry pinwheels may also be made with flaky pastry.

Roll the pastry into a rectangle at least 8 in. wide one way and about ⅛ in. thick. Spread with vegetable extract, cheese, sardine paste, or a mixture made as follows: Cut 4 rashers of bacon finely. Then add chopped onion, a grated carrot, and seasoning. Moisten with a little beaten egg. Spread this across the pastry. Moisten the edges of the pastry and roll up. Cut with a sharp knife into ¼ in. to ½ in. slices. Place flat on an ungreased tray and bake at 475 degrees F. for 10 minutes.

Pools and Water and Bog Gardens

WATER is one of the greatest aids in landscape gardening. Every endeavour should be made to make it a feature in gardens where it is found naturally; where it can be made available in steady supply throughout the year it may be well worth while to consider its possibilities. In this article K. H. Marcussen, Horticulturist, Department of Agriculture, Christchurch, discusses ways in which water can be used for landscape effect, the construction of pools, and types of plants which can be grown in and around water. The section which deals with routine work for November is by Rosalie A. Campion, Horticultural Instructor, Department of Agriculture, Wellington.

WATER gardening has a particular charm and is an attraction for most people. A pool or a stream is the first place children will head for when they have the opportunity. They will play alongside it for hours, especially if there are fish to watch or birds such as ducks or swans. Older people are attracted to water for the restful atmosphere which it usually creates.

Local authorities are quick to realise the value of water gardening. Streams running through towns and cities are frequently beautified, as are also lakes, and they often form the centre of horticultural attractions.

Persons who have a shallow stream passing through their gardens are indeed lucky. Beautification may be simple and can be done cheaply by sloping the lawns to the water's edge. Extensive developments are possible, if the size of the garden permits, and such ideas as a series of pools, connected with waterfalls, can perhaps be worked out.

Artificial streams, of course, may also be developed. There are artesian wells running to waste in many parts of the country. It may be possible to form such surplus water into a stream and run it through the garden; it is not so much the volume of water which gives the beauty as the manner in which it is used.

A pool can be maintained without a constant water supply. Water lilies and many other aquatic plants prefer water which is not being renewed continuously, and water will keep clean for a very long time, provided a balanced population of plants and fish is maintained in the pool.

Streams

Shallow streams with a gentle flow of water are the easiest to landscape and are the type common in home gardens. Steep banks should be avoided not only because they are difficult to keep tidy, but they are a constant danger to young children. Lawns are the best approach to a stream, and mowing will not be a problem if the slopes are gentle. If a bank tends to crumble and fall away, which frequently happens at bends, it may be advisable to consolidate it with boulders. Such reinforcing need not be conspicuous. If it cannot be covered with turf, it can be developed either to form an outcrop of boulders or the stones can be screened by judicious placing of shrubs.

Planting along streams should be given considerable thought and never overdone. Single plants or odd groups of plants look most impressive; the stream itself should not be obscured by plants, but planting should rather emphasise the nature of the waterway.

In larger gardens it may be desirable to guide a stream into one or several pools. A slight fall of the land is all that is necessary for this, and if the volume of water is not too great, it will create conditions which are more suitable for those aquatic plants which prefer still water, such as water lilies.

Because a pool needs some damming, a change of levels can be made fairly easily where the excess water leaves the pool. This can be developed and even a small waterfall is a feature which makes a garden unusual.

Pools

Constantly running water, which is a necessity for a stream, is not essential for a pool; in fact, conditions in a pool with little or no water running into it are more suitable for many aquatic plants. The reason for this is that the temperature of the water is relatively stable, and no plants, aquatic or otherwise, like constantly changing conditions. In a still pool the water will be warmed by the sun during summer, but the temperature of the water will not drop a great deal at night. In winter it will not warm up so much during the day, but it is not so subject to frosts. Ice may form on a pool, but the great volume of water will not reach freezing point.

Where a stream runs into a pool it usually changes this otherwise stable temperature. A shallow stream, if exposed to the sun, can become quite warm, but when not exposed to the sun it can be quite cold. It will consequently have an influence on the temperature of the volume of the water. Furthermore, it is easier to keep fish in a stable pool; traps may otherwise have to be fitted to prevent their escape at the outlet. Such traps are always a source of trouble, as they tend to become blocked with debris.

[*Sparrow*

Pools can be used to advantage in association with rock gardens.

Continuous changing of water is not necessary to keep a pool clean. If a balanced population of various types of plants is kept, in association with fish, water will keep clean indefinitely, the only reasons for cleaning it out periodically being to remove sediment and attend to the plants.

Pools can be made any shape, but the shape should conform with the surroundings. An irregularly shaped pool would look out of place in a formal garden. Planting round the pool should fit the pattern or the effect will be spoilt.

A pool does not need to be very deep. In general, depths varying from

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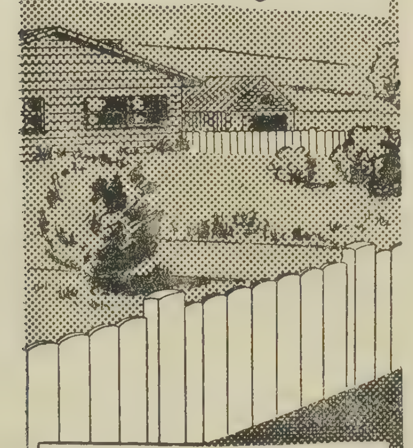

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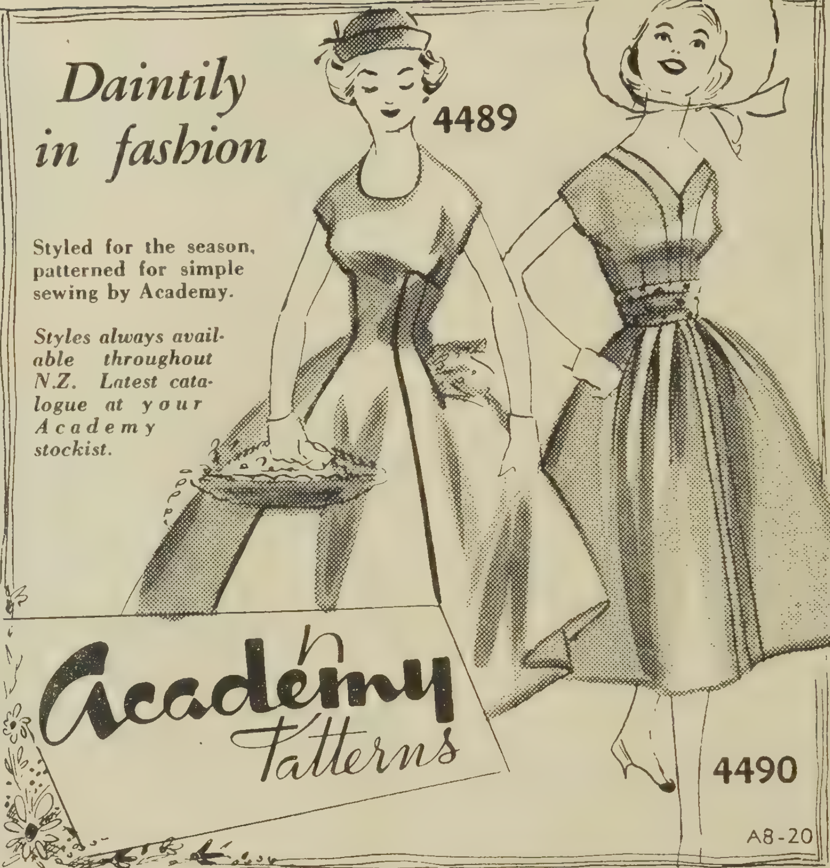

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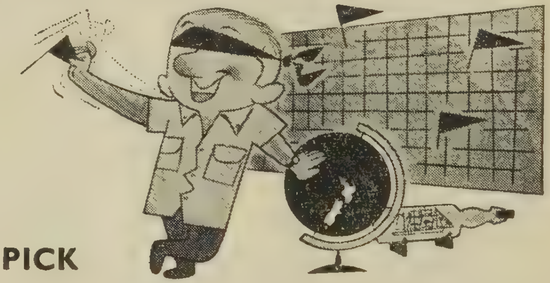

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12 to 24 in. are the most satisfactory. Deep pools should be avoided, as they are a danger to young children.

It is not advisable to place a pool underneath trees. Most aquatic plants prefer full sun, but perhaps the most important consideration is the accumulation of dead leaves, flowers, fruits, etc., which invariably fall from overhanging branches. Plants overhanging streams, on the other hand, create no problem, as debris will be carried away.

Types of Pools

Small pools, such as those sometimes used in rock gardens, can be made by sinking a cut-down wooden barrel into the ground. Such tubs will last for quite a few years and are usually satisfactory. Wine and spirit barrels are safe, but those which have been used for greasy or oily substances are difficult to clean and may be dangerous to use, especially for fish.

Concrete drinking troughs, as are used on farms, are available in various sizes and shapes and provide an easy means of establishing a pool. Like the barrels, troughs require little preparation except excavation of the soil to lower them into position and they are constructed so that leaks should never become a problem.

Where a handy man is able to make a concrete pool much more scope is given. Whereas ready-made troughs are available in limited shapes only, a home-made pool can be designed as desired. The bottom can be made with sections at different levels so that the depth of water is varied. This will allow a greater choice of plants. Sections for bog plants can also be incorporated in the structure.

Concrete blocks, which are now being used for swimming pools, are not as satisfactory for garden pools as poured concrete. The dimensions are too small to facilitate a waterproof structure at a cost comparable to solid concrete.

Construction of a Pool

Great care is necessary in the construction of a concrete pool. A leaky structure is most unsatisfactory because of the falling water level and complications which may arise if the surrounding soil cannot drain the water away quickly enough. A weak place in the construction may not show up for some years and a leak can be very difficult to locate and worse to repair. The extra attention given when constructing the pool will therefore be well worth while.

Bulletin No. 345, "Concrete", available free from the nearest office of the Department of Agriculture, should be studied by anyone contemplating making a pool in concrete. Anyone planning an extensive layout involving several pools will find further information in Bulletin No. 344, "Farm Water Supply", which is also available free from offices of the Department of Agriculture.

▲ Pools should be made to fit into the surroundings by the appropriate use of plants and possibly rocks. National Publicity photo.

The walls of a pool should reach the same upper level all round. Even if the surrounds are higher on one side to form a background, for example, in a rock garden, the top of the wall should not be raised. Otherwise it will appear as if the pool has become tilted.

Facilities for drainage and running off of surplus water are two major factors. It is sometimes necessary to empty a pool to clean it and to do work on the plants. The volume of water is usually much greater than expected and to bail it out is quite an undertaking, especially if the water has to be carried some distance to a sump or drain. If the pool is on a sloping section, it may be possible to syphon the water out with a hose, but it is much better when the pool is being built to construct an outlet and connect it to a drain. The plug can be a wooden stopper shaped to fit the hole. It can be rammed into position gently but firmly and knocked out fairly readily when the pool is to be emptied. It must, of course, be renewed from time to time.

Field tiles can be used for the outlet, but a close-jointed pipe is more satisfactory and should not give trouble provided a wire mesh is placed over the opening when the pool is being emptied. This is a safeguard against blockage.

Run-off of surplus water can be provided for by a stand-pipe reaching to the desired water level or by a pipe being fitted into the wall during construction; when done while the pool is being built it is simple to connect it to the outlet drain. The pipe opening should be protected by a wire mesh to prevent blockage by leaves and other debris which may float on the pool. Run-off into a stream is, of course, simple and can be aided by the wall being a few inches lower at the point.

The level of the water in a pool should be fairly close to the top of the wall, particularly if the construction

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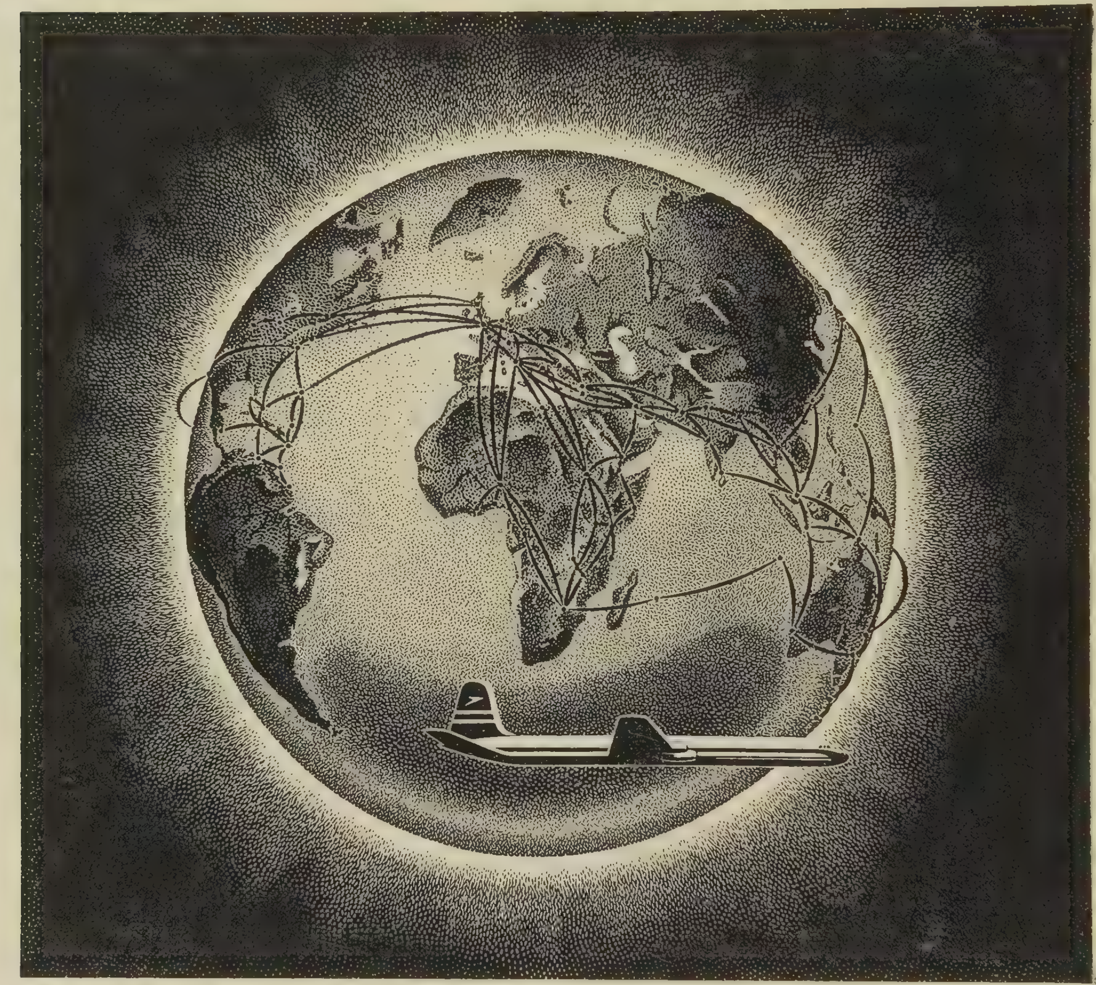

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▲ A formal pool looks well as the focal point in a garden; here it is placed at the end of a path. Elliott photo.

is in smooth concrete. This gives a finish to a pool.

Where the water supply is from the water main, a concealed connection should be brought through the wall. This looks much better than a tap placed somewhere above the pool, and looking like an afterthought. Filling by tap is generally more satisfactory than a ball-cock.

Planting a New Pool

A concrete pool is not suitable for plants or fish immediately after construction, as some chemical reaction may occur. If it has been made the previous summer, it should be left full of water over the winter and is then, after cleaning, satisfactory to use. If, however, a newly made pool is required for immediate use, it can be made safe by treatment with condy's crystals (permanganate of potash). Enough crystals should be added to the filled pool to make the water a deep wine colour. After 3 days it can be emptied and cleaned out and should then be safe to use.

Pool Surrounds

The approaches to the pool should be considered as part of it. Grass is always safe to use; a complete concrete surround is suitable, and, in general, desirable for a formal pool. This is not so for informal, irregularly shaped ones; they should be made to fit into the surroundings by the appropriate use of plants and possibly rocks, some of which can be placed as stepping stones near the water's edge.

Fountains

Fountains are often associated with pools and can look quite attractive, but do not always benefit plants and fish. A light spray is refreshing to plants on hot days, but a continuous spray, day and night in all weathers, can have detrimental effects both in regard to the spray falling on the leaves and possible flowers and to the cooling effect on the water, as discussed earlier. Spray from fountains should always be confined within the pool area.

Water Lilies

The most common plants in New Zealand pools are water lilies (*Nymphaea* sp.). They are available from many nurserymen dealing in herbaceous plants. Named varieties are sold by specialist growers, but they are often sold in colours only or mixed. They are usually sold according to type, and the type to choose must be considered in relation to the depth at which they are to be grown.

The large-flowered water lilies are the hardiest and require greatest depth of water. Vigorous varieties should be chosen for the deeper pools, as they will grow in a depth of 3 ft. of water, whereas the weaker-growing varieties do better in a shallow pool, and a depth of 12 in. is enough for some. In selecting unnamed varieties it is better to see them growing the previous summer so that their vigour as well as colour can be noted.

The stellata type, which is not quite as hardy, has smaller flowers which are held above the water. They are the so-called blue water lilies. A water cover of 6 to 9 in. is sufficient for this type.

The pygmy varieties are miniatures. Like stellatas, they are suitable for small and shallow pools and will grow in even less than 6 in. of water. Though they are reasonably hardy, changeable water temperatures are likely to damage them. Hard frost in itself is not as harmful to these plants. Owing to the shallow depth of water in which they are grown they are more susceptible to damage than other water lilies which are grown in deeper water where the temperature remains more stable.

Other Aquatic Plants

There are a number of aquatic plants available in New Zealand, apart from water lilies, but some care is necessary in their selection. Many of these plants tend to grow too vigorously under our climatic conditions and can become very troublesome if introduced into streams or irrigation ditches. A list of the most undesirable aquatic plants is given later. The following, which are available commercially, are considered safe for general use.

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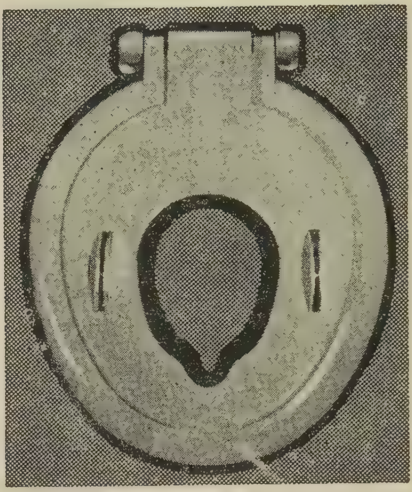

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Nardoo Plant

The Nardoo plant (*Marsilea* sp.) is grown for its clover-like foliage. The leaves float on the water and tend to close up at night like oxalis leaves. If given less than 6 in. of water, the plant may rise above the water.

Arrow Arums

The arrow arums (*Peltandra* sp.) are suitable for very shallow water such as may be found at the edge of natural pools. Their leaves and arum lily-like flowers stand well above the water.

Pickerel Weed

The Pickerel weed (*Pontederia cordata*) is considered the finest blue-flowered aquatic plant. Like the arrow arum it is almost a bog plant. It will grow in only 3 to 5 in. of water but will stand some 10 to 12 in. It stands about 18 to 24 in. high and carries the flowers in spikes.

Water Fringe

Water fringe, known as *Limnanthemum nymphoides*, but now placed under *Nymphoides* is also sold as *Villarsia nymphoides*. It will grow in water 6 to 18 in. deep. The heart-shaped mottled leaves, about 2 in. across, float on the surface while the golden yellow poppy-like flowers rise a few inches above the water.

Parrot Feather

The parrot feather (*Myriophyllum proserpinacoides*) is rather a vigorous plant and can become a nuisance in warm districts. It is valuable as a spawning area for fish and is one of the oxygenating plants. They are thus named because they absorb carbon dioxide from the water and liberate oxygen. Oxygenating plants have probably more value in aquariums than in pools.

[Elliott

An informal pool should blend into the background.

Propagation and Planting

Division is the easiest method of propagation of aquatic and bog plants and is the method which would generally be carried out in home gardens. Spring is the most suitable time for division, when the plants are coming into growth. While bog plants seldom require much special attention, plants which are to be submerged must be handled with particular care, especially water lilies which are gross feeders.

When the plants are cut up it should be ensured that at least one bud is present on each piece of root or tuber, and that they are planted with the buds just free of the soil.

Water lilies can be planted directly in the bottom of the pool, but where the bottom is solid, such as in a concrete pool, it is preferable to grow them in wire baskets. They can then be handled much more readily and the soil will not float away from them.

The soil mixture should consist of turfy loam with a good proportion of old cow manure; 1 in 4 would be suitable. This mixture should be packed well into the basket, which can then be lowered into the water.

If the pool is being cleaned, plants can also be topdressed with old cow manure when they are not being divided; if cow manure is not available, coarse bone flour can be used.

After plants have been disturbed they should not be submerged immediately to their full depth. If the pool has been emptied, it should be filled gradually over a period; or if the plants are in wire baskets, they should be lowered gradually to their permanent position when growth has started. The volume of water may otherwise have a detrimental effect.

Bog Gardens

The soil in a bog garden should be permanently saturated; such conditions are sometimes found alongside streams and pools where the surrounding land is very low lying, but more commonly a pool is constructed so that part of the surrounds forms a bog. Such an artificial bog is usually the most satisfactory for home gardens, as the bog can be confined to a part of the pool surrounds, while the other parts can be dry and give a firm approach. Apart from being much more satisfactory, such a layout generally gives a better landscape effect. The bog plants, some of which grow fairly tall, will set the pool off instead of obscuring it.

Though bog gardens usually are associated with streams or pools, they may also be on their own. A low-

[*Naden Matthews*

Though water hyacinth may be considered a plant of extreme beauty, its evil reputation overseas is evident in other names for it, such as "Florida devil", "the world's worst weed", and "the million-dollar weed". It is now an offence to possess water hyacinth.

lying area which is permanently wet is sometimes found in a garden and usually considered a problem. Such an area could be made into a bog garden and changed from an unsightly place into one of charm.

Bog Plants

The range of bog or waterside plants which are available in New Zealand is much greater than aquatic plants; in fact, most plants which will tolerate moist soil conditions are satisfactory; some are mentioned below.

There are a number of iris which are suitable, notably Japanese iris (*Iris kaempferi* (*Iris laevigata*)), for which moisture around the roots is a necessity in the growing season.

Primulas provide a range of suitable subjects, but they should not be used where the soil tends to become sour. Where the water drains away freely they do well and provide colourful displays.

Nile grasses (*Cyperus* sp.) are very decorative waterside plants for the warmer parts of the country. Their palm-like leaves create a sub-tropical atmosphere.

The monkey musk (*Mimulus* sp.) is another suitable subject. It flowers for a long time and is very bright.

A somewhat similar display can be obtained with marsh marigolds (*Caltha* sp.). They belong to the buttercup family and are among the most colourful, golden bog plants.

Though cannas will grow under fairly dry conditions, they much prefer a moist soil, in which they will grow much more prolifically. They are available in sizes from dwarf to very tall.

Arum lilies (*Zantedeschia* sp.) come into the same category and do well in moist conditions.

Astilbe, in pinks and reds, do better in some shade.

Hosta or funkia will also tolerate some shade; they are mainly grown for their large, decorative leaves.

Ferns, of course, are also valuable as foliage plants, and if something larger can be accommodated, N.Z. flax (*Phormium tenax*) or even bamboo can be considered.

Undesirable Aquatic Plants

Certain aquatic plants can become a liability because they grow too vigorously under our climatic conditions; this danger is greatest in the northern parts of the country.

The plants listed are frequently seen in lists of recommended aquatic plants, but they have all proved troublesome in New Zealand. They should not be planted, and if found growing, they should be destroyed so that they cannot grow again; small pieces as well as seed may further their spread.

Water Hyacinth

Water hyacinth (*Eichhornia crassipes*) is a noxious weed and a campaign is in progress to eradicate it. It is spread by seed or pieces of the tubers.

Water Hawthorn

Water hawthorn, or Cape pond weed (*Aponogeton distachyus*), is often mistaken for water hyacinth. It has dark green floating leaves and hawthorn-like white flowers with black anthers.

Water Poppy

Water poppy (*Hydrocleis nymphoides*) has yellow three-petalled flowers about 2 to 2½ in. across, standing well above the water.

Water Thyme

Water thyme (*Elodea* (*Anacharis*) *canadensis*) grows submerged and has brittle stems thickly clothed with whorls of three or four leaves. They are light green when young and become darker with age.

Crisp-leaved Pond Weed

Crisp-leaved pond weed (*Potamogeton crispus*) has wavy-edged tapering leaves 3 to 4 in. long and ½ in. wide which are densely packed on branching stems. They may be green or appear rosy or reddish brown according to the light. They also are submerged.

Eelgrass

Eelgrass (*Vallisneria spiralis*) has grass-like submerged light green foliage.

Ottelia ovalifolia

Ottelia ovalifolia has elliptical leaves. Some are submerged, others are floating or raised above the surface. Pale yellow flowers are carried aloft in a solitary spathe.

Primrose Willow

Primrose willow (*Jussiaea repens* (*J. diffusa*)) has creeping or floating stems several feet long with olive-green shiny leaves. The small golden flowers form at the leaf axils and rise above the water.

Iris pseudacorus

Iris pseudacorus, which is found with either white or yellow flowers, grows in shallow water or boggy soil. It grows 2 to 3 ft. high and has broad sword-like leaves.

Common Reed

The common reed (*Phragmites communis*) is a tall grass with creeping rootstock. It has been used for binding sand, but under wet and boggy soil conditions its spread makes it undesirable.

Work for November

A weekly check-up on all parts of the flower garden is desirable so that the necessity for spraying, nipping back, hoeing, watering, and feeding of plants is not overlooked. The regular removal of the dead flower heads will remove many of the aphids which concentrate on the flower heads and growing tips of plants.

Roses

Roses will be developing to their peak of blooming in November and spraying should be continued so that the blooms are protected. Attacks by aphids, leaf roller caterpillar, grass-grub beetle, mildew, black spot, and rust should be watched for. Lindane, malathion, or DDT should be used against the insects and thiram or captan should be used at 2-weekly intervals and following heavy rain to prevent attack by black spot fungus. At the first sign of rust or mildew sulphur or Karathane sprays should be applied.

A good method of protecting the bushes is by the regular use of combination sprays or dust. The following have been found suitable:

Combined Rose Spray

Captan or thiram, 50 per cent wettable powder -	1 oz.
Colloidal sulphur, 70 per cent wettable powder -	¾ oz.
Malathion, 25 per cent powder - - - -	¾ oz.
Water - - - - -	4 gallons

Succulent plants can be divided now and planted on sunny slopes or used as a garden edging.

Combined Rose Dust

10 parts of 1 or 2 per cent lindane dust
9 parts of flowers of sulphur
1 part of 50 per cent thiram or captan

If show roses are required, the side buds should be carefully rubbed off each shoot. Removal of all flower buds from new rose plants in the first summer is sometimes recommended. This is not necessary if the plant is making good growth. On bushes which are struggling for existence it is wise to remove all but one bud. This will reduce the strain of flowering and at the same time it will be possible to check that the plant is true to label.

Spring-flowering Plants

Spring-flowering plants such as aubrietias, ericas, and helianthemums can be trimmed back hard after flowering to keep them within bounds and to induce young growth near the centre of the plants.

If *Alyssum saxatile* plants have become straggly and new growths are appearing near the bases of the old shoots, they can be cut back to these growths. This plant tends to die out after 3 to 4 years and if no new shoots are evident, cuttings could be struck now.

The primula hybrid Wanda, polyanthus, and auriculas can be divided now if the planting positions do not dry out too much over summer.

The foliage should not be cut off bulbs until it turns brown, but to tidy the border in the meantime, the leaves can be knotted. In early districts bulbs of crocus, tulip, hyacinth, and narcissus will be ready for lifting. Tulip bulbs need lifting every year unless planted very deeply and the bulbs should be dried in a cool, airy position. Narcissi need be lifted only every 2 to 3 years.

Gladiolus

By the end of November, most gladiolus corms should be planted. In sandy soils the corms should be 6 in. deep, but in heavier soils 3 to 4 in. is sufficient. The position of the bulbs should be marked with a label or stake at planting time to avoid damage. When gladioli planted earlier are being staked, a tie made 1 ft. from the ground and another just below the lowest floret should be sufficient. If plants wilt or go prematurely yellow, it is most probably due to fungal attack of the corms or lower part of the stem. The plants should be removed or burnt. Any bulbs which are only slightly affected should be dipped in fungicide when they are lifted.

The foliage should be examined for signs of silvering caused by thrips which suck the sap. Sprays of DDT emulsion will control this pest.

Chrysanthemums

Rooted cuttings of early flowering chrysanthemums can still be set out in November. Clumps of three plants set 15 in. apart look better than single plants in a mixed border. The plants should be nipped back either a few days before they are transplanted or when the roots are obviously established. About 3 weeks after they are transplanted the plants can be given a dressing of mixed fertiliser at 2 oz. per square yard. A suitable mixture is:

2 parts of superphosphate
2 parts of blood and bone
1 part of nitrate of soda or sulphate of ammonia
½ part of sulphate of potash

To encourage many strong-flowering shoots the plants should be nipped back frequently during the next 2 months. Old clumps will give better blooms if the young shoots are thinned out at ground level. A combination spray for use every 3 weeks to control pests and diseases can be made, using:

Lindane emulsion -	½ fl. oz.
Thiram - - -	1¼ oz.
Water - - - -	4 gallons
or	
DDT emulsion - -	1 fl. oz.
Lime sulphur - -	3½ fl. oz.
Colloidal sulphur -	1½ fl. oz.
Water - - - -	4 gallons

Shrubs

Spring-flowering shrubs such as flowering currant, forsythia, lilac, weigela and broom should be pruned now to remove old branches which have flowered and induce the growth of new shoots for flowering next year. The young growth of most hedge plants should be trimmed back now and can be added to the compost heap. Most shrubs and especially ericas, rhododendrons, and azaleas will benefit from the application of a mulch of compost, sawdust, or thinly spread lawn clippings applied while the soil is still moist. If these mulching materials are not available, stones placed round the bases of plants will conserve the moisture and help anchor plants in windy areas.

Spraying of Shrubs

Several shrubs require spraying to maintain healthy plants. The leaves of azaleas are often swollen with the leaf gall fungus and sprays of bordeaux mixture should be applied.

Plants of the rose family, notably cotoneaster and pyracantha, often die back from the tips, on which the dead leaves remain attached. This is often due to an attack of the bacterial disease known as fireblight and all affected twigs and branches should be burnt. Streptomycin sprays, using a tablespoon to 4 gallons of water, will arrest the spread of the disease.

Beech hedges should be sprayed with lindane emulsion to kill beech aphids and discourage oak leaf miner. Fuchsias, rhododendrons, and lauristinus should be sprayed with DDT or lindane emulsion when thrips are present, as seen by the sticky excreta under the leaves.

Seed Sowing

Seed of a variety of types of plants can be sown this month:

Calendulas for filling gaps in the garden about the new year period

Wallflowers, pansies, violas, *Bellis perennis*, and cinerarias for planting in beds in autumn

Canterbury bells, geums, gaillardias, carnations, aquilegias, scabious, evening primroses, and delphiniums for autumn planting in gaps in the mixed border

Cacti and succulents for additions to the collection or for spring planting

Trees, shrubs, and climbers including kowhia, kalmia, and clematis respectively

Seed of annuals can still be sown to fill gaps in the border.

Planting Out

By now the beds of spring-flowering wallflowers and Iceland poppies have passed their usefulness and should be cleared and prepared for the planting of a summer display. If organic manure such as stack bottom, animal manure, seaweed, or compost was incorporated before autumn planting no more should be necessary now. After thorough digging a dressing of general fertiliser can be used at 4 oz. per sq. yd

One dahlia tuber with a strong shoot will give a good display. The stake should be inserted before the tuber is planted.

In warm, sunny positions celosia, irisene, tuberous begonias, and cannas can be incorporated in the bedding schemes. Geraniums, phlox, petunias, antirrhinums, fuchsias, salvia, and marigolds will form the basis of bedding schemes in colder districts. Geraniums and especially some of the pink varieties are usually attacked by rust which is a fungous disease.

Sprays of:
Lime sulphur - - 3½ fl. oz.
Colloidal sulphur - 1½ oz.
Water - - - 4 gallons

or zineb will keep the rust under control. Care should be taken that the sulphur sprays do not get on paintwork or a black stain will result.

Edging Plants

Two edging plants which give pleasing colour effect in the garden and which can be retained from year to year are *Arabis variegata* and *Pyrethrum aureum*. Arabis with its green and white leaves can be divided now and planted out 1 ft. apart. In 6 months the plants will have grown into attractive bushes for a continuing display through winter. Pyrethrum can be treated similarly, but should be topped back when transplanted. Several of the succulent plants can be divided for use as distinctive edging plants. The rosette type of plants give an attractive finish to a bed. They cost little and need little attention once they are established.

Glasshouse

Careful watering, feeding, and ventilation will now be needed to bring blooms of begonia, streptocarpus, and hydrangeas to perfection. The temperature should be kept as even as possible, and it will be necessary to damp down the floor on hot days to prevent a hot, dry atmosphere and thus reduce pests.

Seed of *Primula malacoides, P. sinensis*, and calceolaria can be sown and lightly covered. Begonias should be potted on as soon as the roots show through the ball of soil, and potted chrysanthemums should be ready for potting into 5 in. pots. Pot plants should never be overfed, but leafy plants such as palms, asparagus ferns, and aspidistras will respond to weekly dressings of sulphate of ammonia at 1 oz. to 1 gallon of water. A dry pot should never be fed and all pots should be watered if necessary about 2 hours before feeding.

Plants growing in windows should be turned regularly to prevent them becoming lopsided. Cyclamen corms should be partially dried off and can remain on their sides outdoors until potting time returns.

General

Tuberous and seedling dahlias can be planted out in prepared soil. The seedling dahlias can be planted 18 in. apart to make a good display. Delphiniums and other tall plants should be securely staked to avoid gale damage. Cuttings of perennials which were taken in spring can now be planted in their permanent positions.

Cuttings of alpine plants can be taken and rooted in pure sand. A position on the shaded side of the house should be conducive to good rooting.

Flat weeds on paths and drives can be watered or sprayed with 2,4-D on a calm day. Dalapon could be sprayed on grass weeds. If there are no young children in the neighbourhood and care is taken, arsenical weedkillers can be used to kill all vegetation where this is desired.

Lawns should be regularly mown and the clippings can be used as a light mulch or put in the compost bin. All lawns and gardens should be regularly proofed against the ravages of grass-grubs by applying ready mixed DDT superphosphate or 1 oz. of 50 per cent DDT to 40 sq. yds. For the home gardener the easiest method of application is to mix DDT with fertilisers.

As the buds develop, sweet peas will benefit from applications of liquid manure. As with pot plants, do not liquid feed when the roots are dry.

Where possible the hoe should be used frequently among flower beds planted on a regular pattern to control weeds and aerate the plants. However, it is much safer to use a light handfork among irregular plantings such as in a mixed border.

Care of Plastics in the Home

By ELEANOR S. CAMPBELL,
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Department of Agriculture,
Auckland

THE word plastics covers an ever-increasing variety of materials of all kinds and shapes which have been built up by man in his laboratories from simple chemical units. Many years ago, when some of these synthetic products first made their appearance, the word plastics to the public meant a cheap substitute for a more expensive product made from natural sources. However, so much work has been done and such tremendous improvements have been made in the properties of these materials that plastics now stand firmly on their own merits.

IN the average home today plastics can be found replacing wood, fibre, and metals. They are used in floor coverings, on wall surfaces, and on tables, benches, and sinks. Kitchen and bathroom utensils are made from them and plastics are used in parts of large equipment such as refrigerators and washing machines. Some of the advantages of plastics are their ease of cleaning, their durability, and their resistance to moths, beetles, and other household pests.

However, different types do have different characteristics; for instance, some plastics will withstand heat, but others may melt or lose shape at temperatures below boiling point. Some are resistant to chemicals, acids, and alkalis and others are damaged by contact with such things as acetone, ammonia, benzene, and kerosene or even animal or vegetable oils. Therefore if the type of plastic being used is known, precautions can be taken to avoid damage.

Plastic materials can be roughly divided into two main classes:

1. **Thermo softening plastics, sometimes referred to as thermo plastics:** These materials may be softened and resoftened by the application of heat and pressure, always provided the heat is not great enough to cause decomposition.

2. **Thermo hardening plastics, sometimes called thermo setting plastics:** These undergo a chemical change with heat and pressure and will not change shape on application of further heat and pressure.

THERMO PLASTICS

Thermo plastics include a large range of plastics, many of which are commonly used in furnishings or utensils in the house.

Polythene

This is used widely in kitchen utensils. Plastic bags and packaging film for use in refrigerators and deep freezes are of polythene.

Polythene is also moulded into a wide variety of kitchen utensils, such articles as jugs, bottles, measures, basins, buckets, food canisters, and a host of other small pieces of equipment being made from this type of plastic. It is light, moisture proof, and resistant to household chemicals, acids, and alkalis and will withstand very hot water (not boiling). It is made up in a wide range of attractive colours.

It should be kept away from flame, as it will melt, though slowly. Certain kinds of polythene utensils are attacked by animal or vegetable oils, alcohol, petrol, and kerosene, but if care is taken not to store such liquids in these containers, they should prove extremely durable.

Vinyl Plastics

This class of plastic will be found in many parts of the house. It includes a large number of materials with differing properties.

Styrene and Polystyrene

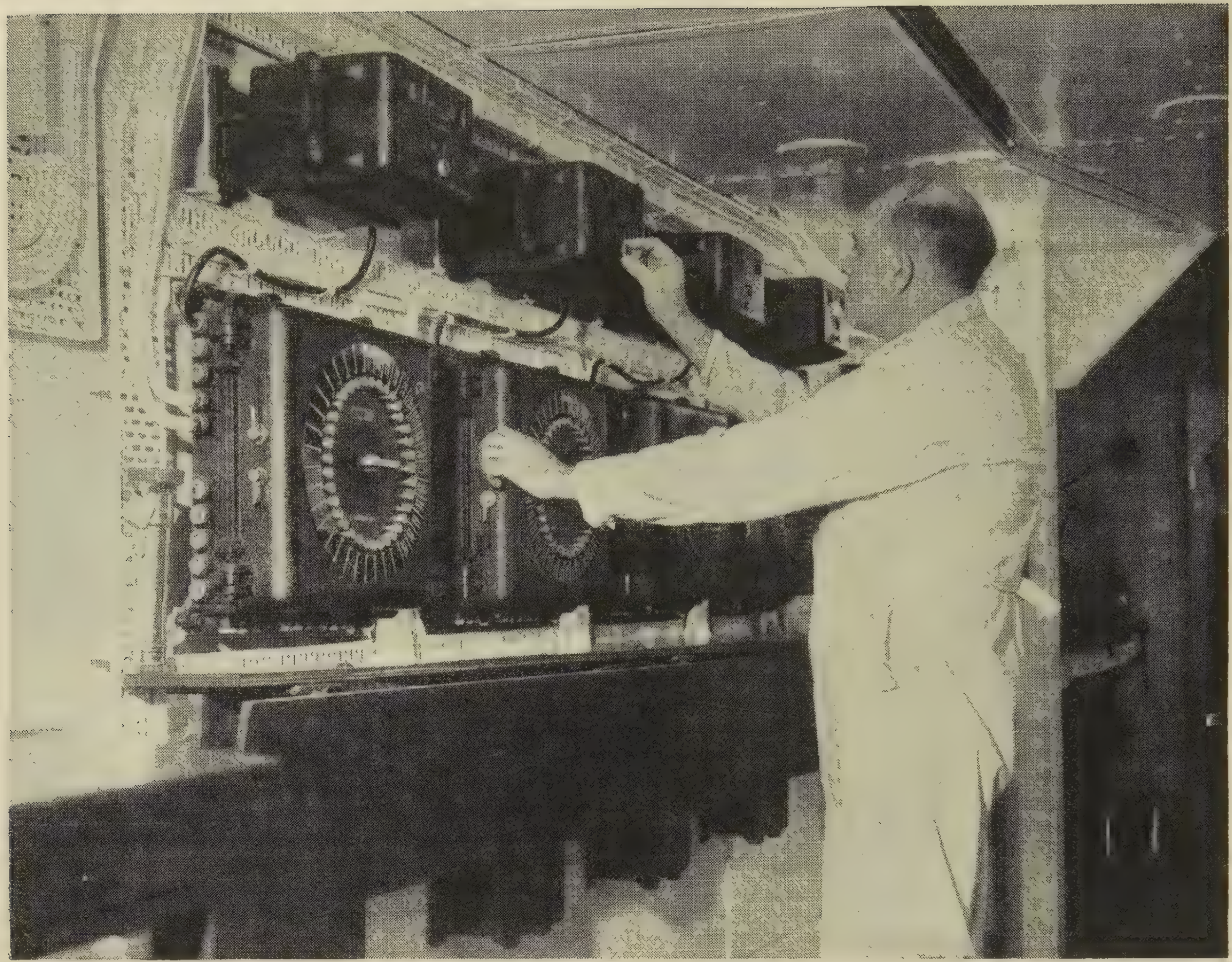
These are types of plastic in common use for moulding into shapes such as butter dishes, lemon squeezers, cups, glasses, plates, combs, and backs and handles of brushes. Whereas most of the polythene articles described are flexible, articles made from styrene and polystyrene are firm and rigid.

Dirt cannot penetrate polystyrene utensils, as they are smooth and nonporous.

This type of plastic has a fairly low softening point, and articles made from it will lose their shape if immersed in boiling water. They tend to be rather brittle and may crack or break fairly easily. They can be clear or coloured.

Polyvinyl Chloride or P.V.C.

The initials P.V.C., unknown to the public a decade ago, are now in common use. Plastic floor coverings.



Half a degree either way

Ships on the New Zealand run have just *got* to be refrigerated ships. Without them the trade in meat, cheese, butter, fruit and quick frozen vegetables, on which the Nation depends, would stop dead.

Refrigeration. . . . It sounds so easy. But have you ever thought what it really means in terms of design and space problems, not to mention money problems? Let's look at some of them.

The temperature must be right—absolutely right. Chilled meat is carried at 29½° F, with only ½° F. leeway in either direction; it can be carried at 29° F, it can be carried at 30° F, but not a fraction of a degree above or below.

Restrictions on other types of refrigerated products are rather less exact, frozen meat, for example, calling for a temperature of 14 or 15° F. The design must be right. Refrigerating plant takes up a lot of space with the mass of complicated machinery, insulating materials – both bulky and heavy – that there are. All these reduce the total cargo capacity.

Quick delivery is, of course, imperative, so that the trend is towards faster ships. Designers are producing them, but to be faster they must be slimmer and this reduces cargo capacity even more. . . .

This is one of the complications which the New Zealand Overseas Shipping Lines accept as everyday routine. The future is likely to bring even greater problems but, however complex these may be, they can be overcome when there is brought to bear upon them the combined skills which have solved so many shipping problems in the past. Co-ordinated organisation thus benefits everyone. It benefits you.

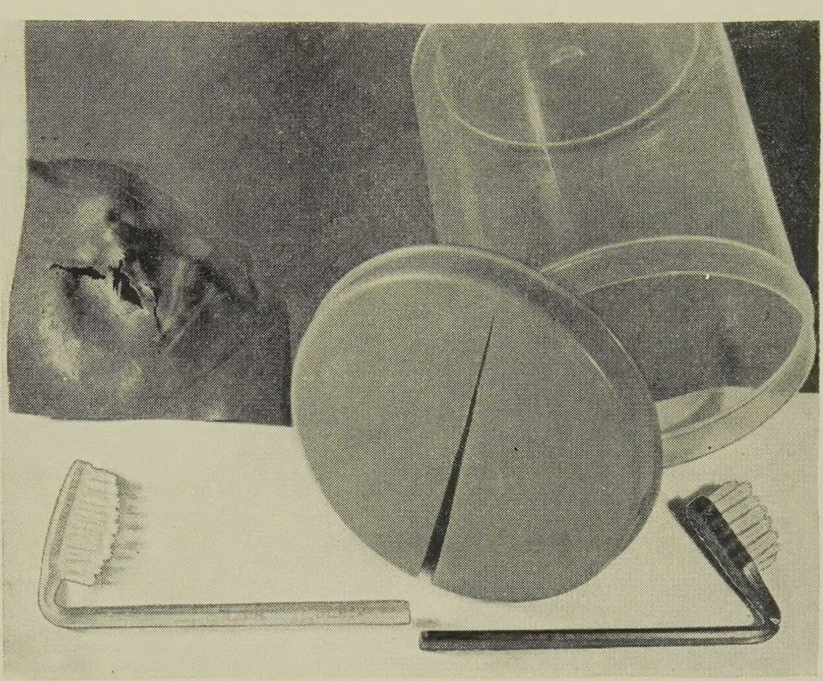
Issued in the interests of mutual understanding by

NEW ZEALAND OVERSEAS SHIPPING LINES

SHAW SAVILL & ALBION CO. LTD · THE NEW ZEALAND SHIPPING CO. LTD · PORT LINE LIMITED · BLUE STAR LINE LIMITED tiles, lino, unholstery, wall coverings, car seats, and panelling are in general some kind of P.V.C.-coated fabrics.

Plastic lino or lino tiles: These have a non-porous surface and are water, acid, and stain resistant. Some types have a glossy surface.

Other plastic tiles have a matt finish and are slightly more rubbery to feel than the smooth, glossy type. Whatever type of plastic floor covering is used, it is wise for the purchaser to find out if it is resistant to alkalis, alcohol, and petrol or petrol derivatives such as kerosene. Some types of plastic floor tiles or lino are damaged by these and harm can be done by using polishes and cleansers containing them. Sometimes heavy spraying with insecticides on or around these plastics may cause damage if the insecticide has a kerosene base.



Plastics damaged by wrong → treatment. The toothbrushes were immersed in boiling water, which made the plastic soft and easily bent. The vinyl sheet, useful for bench or table covering, has had a hot iron placed on one corner. The jar and lid are of polystyrene, some forms of which tend to crack and split easily.

Upholstery: P.V.C.-coated fabrics are used to a great extent in upholstery work in cars and furniture and in interior decorating. They can be made to resemble leather and are also used for handbags, satchels, brief cases, and similar articles. The surface is waterproof and therefore wall coverings, car seats, and panelling can be washed with ordinary soap and water to remove dirt.

It is not wise to use cleansers, chemicals, or polishes on these materials; nor is it wise to use abrasives or very alkaline soaps, such as soft soaps, as these may cause damage. Insecticides or moth proofing agents may also harm the plastic; their use on this plastic is quite unnecessary, as moths do not attack it.

P.V.C. adhesive sheet: This type of plastic sheet is widely used to cover shelves, benches, tables, and any other flat surfaces. It is resistant to liquids, acids, oils, or grease spilt on it, all of which can be easily wiped off. Though boiling water spilt on the plastic will do no harm, concentrated heat such as that from a hot saucepan or hot iron will do damage.

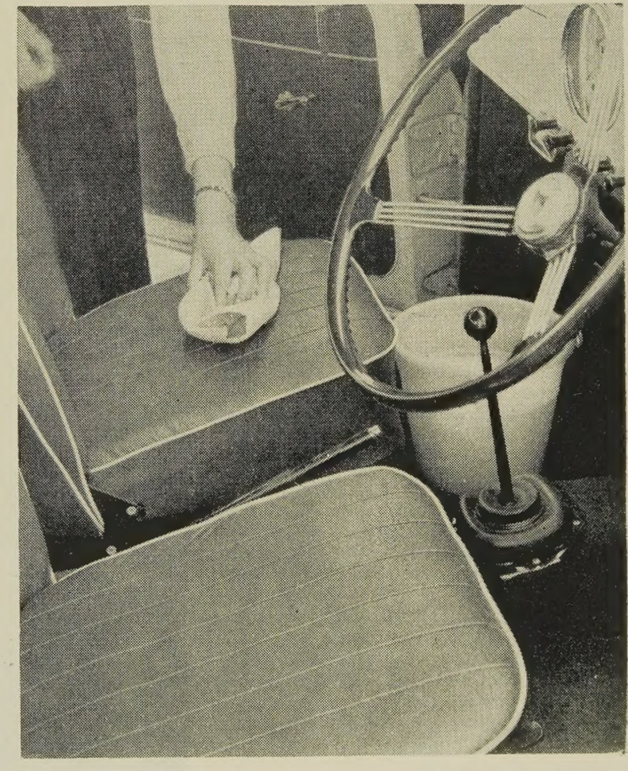
Acrylic Plastics

The main type of this group of plastics in use in the home is technically known as polymethyl methacrylate. It is normally produced in a flat sheet which can be moulded into any desired shape. Sinks, sink benches, draining boards and splashbacks, trays, bathroom fittings, and toilet accessories are often made of this type of plastic, which, like all the others already mentioned, can be produced in a variety of shapes and colours.

This plastic can be produced with translucent or opaque colours or it can be left clear and transparent. Many other articles such as coat hangers, lamp stands, photo frames, and even ornaments can be carved or sculptured from this material.

If scratches occur on acrylic articles, an application of a small quantity of brass or silver cleaner will remove any trace of them. Any cleaning agent such as benzene or turpentine may attack this plastic.

As the acrylics are thermo plastics, they will soften in heat. Articles from this plastic will stand up to fairly



The seat covers and inside panelling of this small car are made of plastic material. This is easily kept clean by washing with a soft cloth and warm water with a mild detergent.

high temperatures, and boiling water spilt on them will do no harm, but hot saucepans, straight from the stove, placed on a bench of this plastic will probably cause it to rise up in a bump. This property the sheeting has of becoming pliable on the application of heat is used to advantage with small pieces for the home handyman. These pieces can be put in the oven until they become soft and pliable and then moulded into various small shapes as desired, such as sweet dishes or small ornaments.

THERMO HARDENING PLASTICS

Perhaps the best known of the thermo hardening plastics to housewives are the laminated plastics and plywoods. This colourful, attractive sheeting is very suitable as a firm, hard, smooth surface for tables, shelves, furniture, or any flat surface, horizontal or vertical, except flooring.

Though these plastics are thermo hardening, they are heat resistant only to certain degrees, depending on the make. They will withstand liquids spilt on them up to and very often beyond boiling point, but concentrated heat in one spot, such as from a hot iron or hot saucepans or pressure cookers placed on the surface will cause damage.

PLASTIC PAINTS

Plastic paints are easy to apply and leave a surface, not necessarily glossy, which may be washed with soap and water. Plastic surface coatings suitable for floors, furniture, and panelling are also available. They are frequently used on wood instead of varnish or French polish. There is also a plastic coating suitable for painting on linoleum. These coatings form a hard, clear, protective film over the wood or linoleum. They need very little care, apart from washing, sweeping, and dusting. No polishing is required, as they keep a lustre.

They provide a hard-wearing, scratch-resistant, heat-resistant, moisture-resistant surface and are unaffected by water, spirits, alcohol, grease, or fats. Anything spilt on them can easily be wiped off with a damp cloth.

NYLON

Another type of plastic, nylon is perhaps usually associated with clothing and textiles, but it is also extensively used in brush manufacture, both domestic and industrial. Brushes of all kinds—toothbrushes, handbrushes, hair brushes, and clothes brushes are only a few household ones—are frequently made with nylon bristles and some other type of plastic back or handle.

This plastic is extremely tough and long-lasting. Certain kinds of nylon articles can be sterilised by boiling water. However, this should be checked on before any brush with nylon bristles is immersed in boiling water. Nylon is not affected by bacteria, moulds, or insects and because of its smoothness it is easy to wash and is hygienic. Nylon washers are available for taps and have a long life.

EASE OF CLEANING

One of the greatest advantages of plastics is their ease of cleaning and long life. A wash or wipe with water and soft cloth is generally sufficient to keep them clean. Most plastics have a smooth, non-porous surface, so scouring powders or abrasive pads are not needed and may scratch the surface. Heat, either wet or dry, may affect the thermo softening plastics and, though most of the newer kinds burn only slowly, they may melt or lose shape, so they should be kept away from flame or concentrated heat.

If floors, furniture, or tables are being covered with plastic materials, the maker's instructions should be followed very carefully in the preparation of the surface to be covered and in the selection of the right type of adhesive and the correct application of it. If plastics are being sewn, finding out the best method of doing this (use of the right size needle, stitch, and best kind of thread) is worth while. If instructions given with plastic materials are followed, the many different kinds of articles used in the house will add brightness and colour and give long life for a minimum of upkeep.

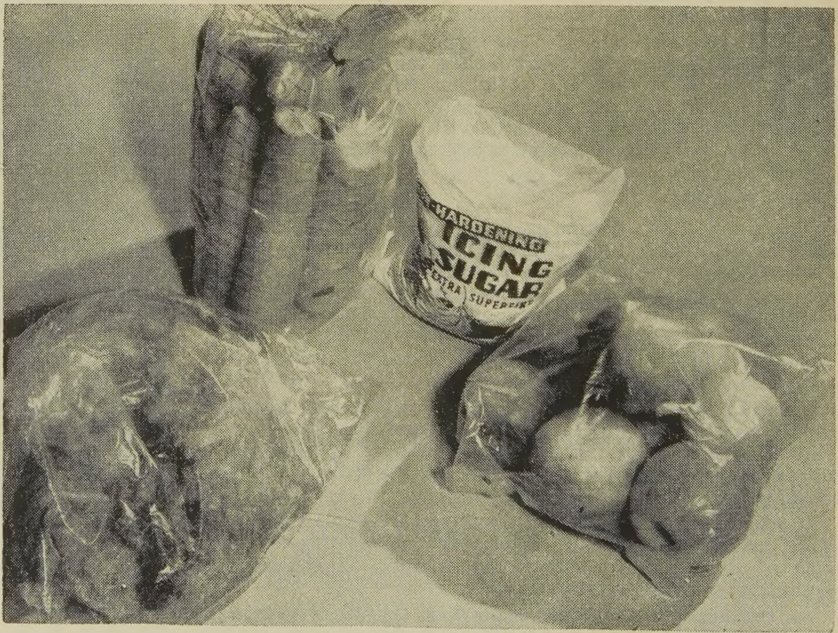
Polythene Bags Need Careful Treatment

POLYTHENE bags, if they are treated correctly, are very useful for the hygienic storage of food. Moist or dry food can be successfully stored in these bags either in or outside a refrigerator.

Bags of various sizes and thicknesses are readily available, but a few simple precautions are necessary when they are used. It must be remembered that the fabric is flimsy and easily torn by sharp projections such as bones in meat or fish or other harsh surfaces.

Also such bags retain odours if not thoroughly washed, rinsed, and dried. This requires a little more attention than may be realised, because unless the drying out is done thoroughly before the bags are put away, bacteria will develop in the dampness and will give a stale odour to whatever food is next stored in them. If the bag is thoroughly dried inside and out and kept well open to air before it is stored, all will be well.

—*MAUD B. STRAIN,*
Home Science Instructor,
Department of Agriculture,
Dunedin



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Destination . . dump or dimpled cheek?

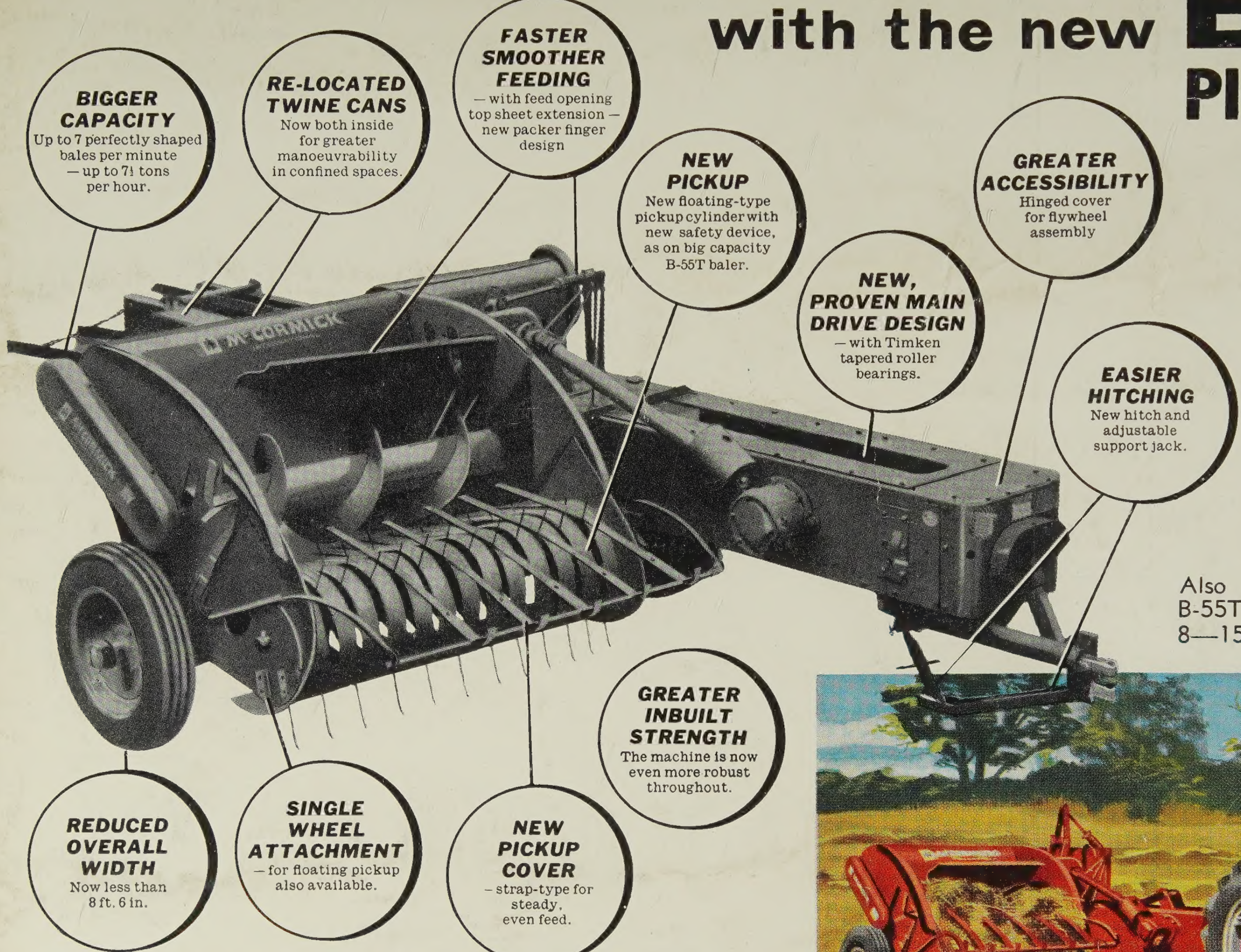
Cool store owners know in advance! Carefully tended trees and unblemished crops won't mean much if the market isn't ripe at the same time. A glutted market can mean rotting fruit . . . months of work wasted. That is, unless you have a Westinghouse Recold Cool Store. Safely resting in controlled cold, your fruit remains as crisp and fresh as harvest morn until the *market* turns rosy. Orchardists all over the country are saying "I should have installed a cool store years ago". It costs you nothing for an estimate from any of the agents listed below.

H. W. Clarke (N.Z.) Ltd., 42-46 *Cable Street, Wellington;* 10 *Teed Street, Newmarket, Auckland;* 256 *Cashel Street, Christchurch;* 1 *Cliff Street, Timaru;* 84 *Tainui Street, Greymouth;* 280 *Hardy Street, Nelson; Cnr. Great King and St. Andrews Streets, Dunedin;* 159 *Spey Street, Invercargill.*

H.W. CLARKE
WESTINGHOUSE
RECOLD STORE

EASIER BALING... FASTER THAN EVER BEFORE!

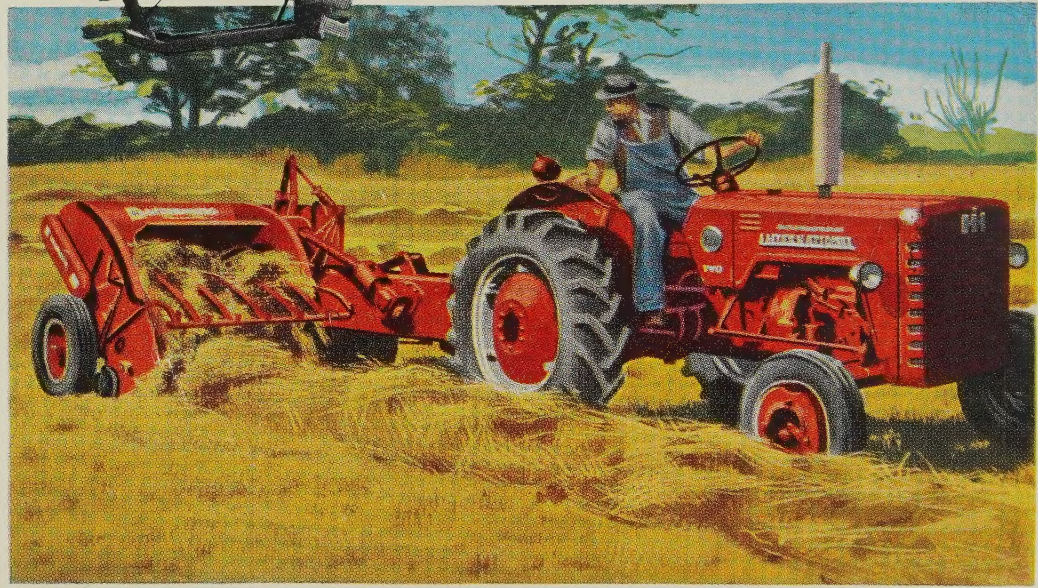
with the new B-45 MARK 2 PICKUP BALER


BIGGER CAPACITY
Up to 7 perfectly shaped bales per minute — up to 7½ tons per hour.
RE-LOCATED TWINE CANS
Now both inside for greater manoeuvrability in confined spaces.
FASTER SMOOTHER FEEDING
— with feed opening top sheet extension — new packer finger design
NEW PICKUP
New floating-type pickup cylinder with new safety device, as on big capacity B-55T baler.
GREATER ACCESSIBILITY
Hinged cover for flywheel assembly
NEW, PROVEN MAIN DRIVE DESIGN
— with Timken tapered roller bearings.
EASIER HITCHING
New hitch and adjustable support jack.
GREATER INBUILT STRENGTH
The machine is now even more robust throughout.
REDUCED OVERALL WIDTH
Now less than 8 ft. 6 in.
SINGLE WHEEL ATTACHMENT
— for floating pickup also available.
NEW PICKUP COVER
— strap-type for steady, even feed.
McCORMICK

New McCormick International B-45 Mark 2's gentle, leaf-saving pickup sweeps your fields clean — delivers up to 7 perfectly-shaped bales per minute! You'll find too, even as a single operator, that the B-45 Mark 2 offers unparalleled economy in time, effort—MONEY! You save more on operation costs, handling, quick stacking — gain handsomely on bale tonnage and simplified, **easier** operation.

Behind the B-45 Mark 2 you have the country's most experienced dealer service organisation. Have **your** IH dealer tell you more about the benefits of owning a B-45 Mark 2 Pickup Baler.

Also available: McCormick International B-55T Twine-tie Baler with capacity up to 8—15″ x 19″ bales per minute.



McCormick International B-250 tractor pulling a B-45 Mark 2 Baler.

International Harvester Company of N.Z. Ltd.

Branches and Dealers throughout New Zealand